OVERSIGHT ON THE FAA'S FISCAL YEAR 1990 R&D PROGRAM

HEARINGS

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

OF THE

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

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OVERSIGHT ON THE FAA'S FISCAL YEAR 1990 R&D PROGRAM

TUESDAY, APRIL 11, 1989

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS,

Washington, DC.

The subcommittee met, pursuant to call, at 2:10 p.m., in Room 2318, Rayburn House Office Building, Hon. Tim Valentine (chairman of the subcommittee), presiding.

Mr. VALENTINE. We'll get started.

This is the first of two sections of a hearing by the Subcommittee on Transportation, Aviation and Materials. We'll hear from the Federal Aviation Administration with respect—and others—with respect to the R&D budget, and the discharge of this subcommittee's oversight responsibility.

The first witness will be Mr. James L. Kolstad, who's Acting Chairman, the National Transportation Safety Board. And the first panel will consist of Mr. J. Donald Reilly, a Chairman, Industry Task Force on Airport Capacity Improvement and Delay Reduction; Mr. Siegbert Poritzky, Vice President, Technical Affairs, Airport Operators Council International.

I would like, of course, to welcome everyone here today, witnesses and—and spectators.

This hearing on the Federal Aviation Administration's FY 1990 Research and Development Program.

Aviation and air transportation have become a major factor in our daily lives, the national economy, and our ability to compete in the world market. Never has the need to enhance our aviation technology been so great.

People everywhere acknowledge that the aviation system in the United States is the best in the world—today! However, other countries are making tremendous advances in quality and quantity—in the quality and quantity of their aviation services. They are increasing their research efforts and are telling the world that they plan to actively compete with the United States in the world markets.

We must respond to that challenge. We must also show the world that the aviation problems we are currently facing can, and will, be overcome. That was what the Aviation Safety Research Act of 1988 was all about; that is what this hearing is all about.

Specifically, this hearing is not intended to be a detailed examination of FY 1990 R&D budget request—that's what the appropriations committees' hearings will be all about.

It is not intended to be a detailed program review of all the FAA's R&D projects—that's what the FAA does as an internal management function.

This hearing is to assist this subcommittee in carrying out its responsibility to ensure that the money authorized by the Congress for aviation research and development is spent wisely and in the best interest of the public.

Today we will hear issues raised from three different aviation perspectives. The first will be safety, as discussed by the independent government watchdog: the National Transportation Safety Board.

The second will be airports, represented by the Airport Operators Council International and the Chairman of the Industry Task Force on Airport Capacity Enhancement and Delay Reduction.

The third perspective will be the customers, represented by the Air Transport Association, the Aircraft Owners and Pilots Association, and the Air Line Pilots Association.

Tomorrow we—the hearing will move downstairs to Room 2247—two two four seven. There, starting at about one o'clock p.m., the FAA will have several displays operating that will demonstrate some of the recent research accomplishments.

One of the displays will be the famous aircraft situation display used by FAA's flow control to see the position of every controlled aircraft operating in the system.

I think that and other demonstrations will be of particular and special interest to us.

The hearing will reconvene then at 2 p.m. and we'll start off with the General Accounting Office testimony and devote the remainder of the time to discussions with the FAA.

I recognize at this time the Ranking Republican Member of the subcommittee, Mr. Tom Lewis.

Mr. LEWIS. Thank you, Mr. Chairman.

The hearings today and tomorrow on the Federal Aviation Research program are among the most important this subcommittee has ever held. That is because for the first time in its history, the agency is making research plans that will reach into the next century. Therefore, the long term impact of the results of the research to be conducted will be marked by advances in aviation safety for decades.

The reason for this historical change in FAA's research program is the Aviation Safety Research Act of 1988, Public Law 100-591. The legislation originated in this subcommittee last Congress and eventually passed both Houses without a single vote against the bill.

A major reason for the successful passage of the legislation is, in my opinion, the fact that Members of Congress recognize the importance—long-range research as a way of significantly increasing aviation safety.

FAA has made major strides in developing plans to implement the Act. The development of a plan for research was followed by an open forum in which the participants were representatives of the

various groups and organizations in the aviation community. Finally, we had the plan before us in the form of the FY 1990 budget request.

Mr. Chairman, I look forward to hearing the testimony today on the strengths and weaknesses of the FAA research proposal.

I also want to commend you, Mr. Chairman, for your leadership in calling these important hearings.

Thank you.

Mr. VALENTINE. Thank you, sir.

We're ready for the first witness. Mr. Kolstad, if you'll come around and have a seat, and your prepared statement will appear in the record and you may summarize or otherwise proceed as you deem appropriate.

STATEMENT OF JAMES L. KOLSTAD, ACTING CHAIRMAN, NATIONAL TRANSPORTATION SAFETY BOARD, ACCOMPANIED BY BUD LAYNOR, DEPUTY DIRECTOR, BUREAU OF TECHNOLOGY, NTSB

Mr. KOLSTAD. Thank you, Mr. Chairman, Mr. Lewis.

I'd like to first take an opportunity to congratulate you, Mr. Chairman, on your new position as chairman, and tell you that we're always pleased to appear before this committee to present our views on this very important role of science and technology.

With me here today is Bud Laynor, who is Deputy Director of the Bureau of Technology.

And I have a brief statement, Mr. Chairman, that I'd like to go ahead and read and the rest will be submitted for the record.

Assuring the safe separation between aircraft enroute in terminal areas and on the ground, undoubtedly will be the FAA's most challenging task as system capacity grows.

There have been many positive actions initiated which should reduce the risk of airborne collision. For instance, the designation of air space for altitude reporting transponders will be required, combined with conflict alert project for VFR as well as IFR traffic in en route and terminal computers.

The Safety Board has been following the development of an independent airborne collision avoidance system for about 20 years. And we strongly support the phased implementation of the Traffic Alert and Collision Avoidance System.

While there has been a great amount of attention given to air—to the airborne collision problem, there has been insufficient attention given to the prevention of collisions on the airport surface during takeoff and landing operations. This constitutes, we believe, one of the Safety Board's major concerns.

Following a near collision of two DC–10s at the Minneapolis-St. Paul International Airport in 1985, the Safety Board investigated 25 more runway incursion incidents, which were summarized in a report issued in May 1986.

The Board found that the incursions were the result of both controller errors and pilot deviations. A number of recommendations addressing such issues as controller coordination procedures, training, pilot-to-controller communications, and airport signing were issued to FAA.

The FAA accepted many of these recommendations and established a Runway Incursion Task Force. However, even with the increased awareness of the problem, runway incursions continue to occur, some of which have resulted in accidents.

The Safety Board views these occurrences as indicators of a most significant safety hazard. Further, we believe that the potential for an accident will continue to grow as the number of operations at existing airports increase.

We must recognize that human error on the part of pilots and controllers is possible even under the best of circumstances. There must be redundancy provided by automation similar to that which is present to prevent airborne collisions.

Since 1970, the Safety Board has issued over 30 safety recommendations to the FAA relating to the severe weather hazard. Most of these specifically addressed the microburst wind shear phenomenon that has been identified as the cause of at least four fatal accidents and 438 fatalities since 1973.

The recommendations cited the need for the development of a ground based detection system, airborne detection and guidance equipment, improved technology to enhance communications between controllers and pilots, and pilot training programs.

The FAA has taken positive actions in each of these areas and, in 1986, developed an Integrated Windshear Program Plan. The Safety Board is encouraged with the way in which the program was administered. We have now reached the point that much of the R&D effort has been completed and we eagerly await the tangible results of those programs.

Despite the progress of the FAA weather programs, pilots will be operating for several more thunderstorm seasons into major airports with the same weather information that was available the day of the crash—that was available the day of the crashes in Kenner, Louisiana in 1982 and Dallas/Fort Worth in 1985.

There's no substitute for pilot awareness and training to cope with the microburst hazard.

Human factors has long been recognized as an area in need of more intensive research and development. The Safety Board is pleased that the FAA responded to the Aviation Safety Research Act of 1988 by appointing Dr. H. Clayton Foushee as the Chief Scientific and Technical Advisor for Human Factors.

We worked closely with Dr. Foushee while he was at NASA and we look forward to an even closer association with him in his new position.

The FAA and industry position on the life of aircraft has been that airplanes can be operated safely for an indefinite service life provided that they are maintained with effective inspection, corrosion control, and repair programs.

The FAA has recognized, however, that the state of present nondestructive inspection technology might be limited with regard to the detection of small cracks in airplane structures that may suddenly become critical when several adjacent small cracks join together into a large crack.

The Safety Board supports the FAA R&D programs to review failure mechanisms related to age, fatigue, corrosion, crack propagation, and the delamination of airplane structures, and to develop

new inspection equipment that will enhance the ability of inspectors to detect disbonded structure and MSD.

We understand that the FAA recently has established a new position for a Natural—I'm sorry—a National Resource Specialist having expertise in non-destructive testing. The Safety Board urges the FAA to give priority to this program.

We also support the FAA's Aviation Standards activities to increase the surveillance of air carriers to determine the effectiveness of existing inspection and corrosion control and to optimize industry-wide corrosion control practices.

Similarly, we support the industry efforts, led by the Air Transport Association with the participation of the airframe manufacturers, to identify those parts of the airplanes in our fleet that should be replaced or repaired as the airplanes reach a prescribed number of hours flown, cycles or calendar age.

The FAA's Research, Engineering and Development Plan specifically addresses nine projects on aviation safety including airworthiness, crashworthiness and aircraft operations subject areas. The Safety Board believes that the individual elements of these projects encompass the significant accident causal issues.

Keeping up with state-of-the-art technology undoubtedly is a challenge for the FAA's R&D aircraft certification staffs. Today more than ever, the aviation industry is into an era of aircraft design with new materials, microprocessor controlled devices, digital fly-by-wire controls, glass cockpit instrument displays, and sophisticated flight control systems.

The FAA is confronted with the certification of airplanes with side stick controllers and fly-by-wire systems, the certification of prop fan propulsion systems and the certification of tilt rotor aircraft.

The R&D of these new technologies is accomplished largely by the manufacturers sometimes with support from NASA. The FAA often finds itself in a position of playing catchup in R&D initiatives. They need to have a cadre of highly qualified engineering experts and they need the resources in support to attract such people to assure that these R&D projects are effective.

That completes my formal statement, Mr. Chairman. I'd be pleased to respond to any questions you may have.

[The prepared statement of Mr. Kolstad follows:]

National Transportation Safety Board
Washington, D.C. 20594

Safety Information

Testimony of

Acting Chairman

James L. Kolstad

National Transportation Safety Board

before the

Transportation, Aviation and Materials Subcommittee

Committee on Science, Space and Technology

House of Representatives

Regarding

Aviation Safety and Related Research and Development

April 11, 1989

Mr. Chairman, I want to take this opportunity to congratulate you on your ascendancy to the leadership of this subcommittee. We at the Safety Board have always been pleased to appear before this subcommittee to present our views on the very important role of science and technology in enhancing transportation safety. I wish to thank you for the opportunity to discuss the Federal Aviation Administration's research, engineering, and development activities as they relate to our concerns of aviation safety.

A few years ago, when asked about the most significant threats to aviation safety, Safety Board spokesmen most often cited the risk of collisions, both in the air and on the runway, and the dangers imposed by severe weather. Those with short memories might accept a view that collisions and severe weather are less of a threat today than other publicized hazards. However, the Safety Board remembers too well the collision between the two Pan American and KLM Boeing 747s at Tenerife on March 27, 1977 that cost 574 lives, and the midair collision between an Aeromexico DC-9 and a PA 28 over Cerritos, California on August 31, 1986 that resulted in 82 fatalities, to become complacent about the collision threat.

Furthermore, our investigations of incidents, near midair collisions and runway incursions involving both pilot deviations and air traffic controller operational errors give us ample reason for continuing concern about the risk of collisions, particularly when they involve air carrier aircraft with the potential for high loss of life.

As for severe weather, we need only to remember the microburst windshear accidents involving a Pan American B-727 at Kenner, Louisiana on July 9, 1982, and a Delta L-1011 at Dallas Fort Worth on August 2, 1985, to recall the potential for such accidents as another summer season approaches. We are pleased that the FAA's plan for research, engineering and development addresses collision and severe weather hazards, and I will speak more about those ongoing activities shortly. Many of the other aviation safety issues are exemplified in more recent accidents.

On August 16, 1987, a Northwest Airline DC9-82 airplane crashed shortly after takeoff from the Detroit Metropolitan Airport, killing 154 persons on the airplane and two the ground. There was strong evidence to support the Safety Board's conclusion that the flightcrew initiated the takeoff with the airplane's wing flaps retracted as a result of their failure to accomplish the takeoff checklist.

On November 15, 1987, 28 lives were lost when a Continental Airlines DC9-14 airplane crashed after takeoff from the Stapleton International Airport in Denver, Colorado. The Safety Board determined that the captain failed to have the airplane deiced a second time after a takeoff delay of 27 minutes that resulted in an attempted takeoff with ice on the airplane's wings.

The Board cited the low experience of both pilots in their respective positions and confusion on the part of air traffic controllers that led to the takeoff delay as contributing factors in the accident.

Both of these accidents involved human performance issues. The Safety Board and foreign authorities have other U.S. air carrier accidents currently under investigation in which human performance issues such as cockpit resource management, adherence to procedures, interpretation of approach plates, and decisionmaking may have been factors. Consequently, we view human performance factors as a very important element of the research and development plan, and we support the Aviation Safety Research Act of 1988 which directed FAA to undertake such research.

Certainly another well publicized concern within the commercial aviation industry is that of assuring the continuing airworthiness of our aging aircraft fleet. The FAA and industry began to give serious attention to this problem in the mid 1970's when it became apparent that many jet transport airplanes would continue to remain in service after passing their economic life as envisioned by the manufacturer and as used in design fatigue life criteria.

The concern was heightened after an accident on May 14, 1977, in Lusaka, Zambia involving an older B-707 operated by Dan Air Service of Great Britain. In that accident a horizontal stabilizer rear spar failed. The problem was metal fatigue that was not detected until the secondary structural load path also failed, resulting in a separation of the stabilizer during a landing approach. Several actions were taken to assure that metal fatigue damage in older airplanes would be detected and repaired before failure of major structure.

The accident involving the Aloha Airlines B-737 on April 28, 1988 brought new focus to the problem. As you recall, a major part of the fuselage structure, including the upper skin of the forward cabin, failed and separated from the airplane at 24,000 feet over the Pacific Ocean, resulting in one fatality.

The Safety Board will consider the probable cause of this accident in a public meeting on May 9. Some of the issues that will be discussed are the manufacturer's design criteria, the operator's inspection, corrosion control, repair programs and the FAA's aging airplane programs. The report likely will address the need for research and development in the areas of non-destructive inspection technology and the human performance aspects of maintenance inspections.

Another aviation safety issue of public concern is that of security against sabotage and terrorism. The Safety Board participated in the investigations of the crash of the Pacific Southwest Airlines BA-146 in San Luis Obispo, California on December 7, 1987 and the crash of the Pan American B-747 in Lockerbie, Scotland on December 21, 1988. However, we have historically played a supportive role in the security aspects of such accidents, leaving that part of the investigation to other agencies having extensive expertise in those areas.

We have reviewed the FAA Plan for Research, Engineering and Development to assess the adequacy of those programs that address safety threats posed by collisions, weather, human factors, aging airplanes and the adequacy of programs to enhance the survivability of occupants in the event of aircraft accidents.

The Safety Board is pleased with the efforts of the House Science and Technology Committee that led to the adoption of the Aviation Safety Research Act of 1988 and with the efforts of those FAA personnel who, in compliance with the act, drafted the national aviation research plan. It is encouraging to review a plan which outlines a coherent approach to both near term and long term R & D requirements.

The present and future challenges facing the FAA are to assure that the National Airspace System will accommodate the forecasted growth in civil aviation, which will mean about a 2.5 percent per year increase in air traffic operations, while at the same time improving safety within the system. The Safety Board has the responsibility to assure that the objective of increased operational capacity does not compromise the safety of the traveling public. With this objective in mind, separation of aircraft both in the air and on the ground must be ensured.

Collision Avoidance

Assuring the safe separation between aircraft enroute, in the terminal areas and on the ground undoubtedly will be the FAA's most challenging task as system capacity grows. There have been many positive actions initiated which, when implemented, should reduce the risk of airborne collision. For instance, the designation of airspace where altitude reporting transponders will be required, combined with the installation of conflict alert logic for VFR as well as IFR traffic in enroute and terminal computers, will add much needed redundancy to controller performance.

The Safety Board has been following the development of an independent airborne collision avoidance system for 20 years, and we strongly support the phased implementation of the Traffic Alert and Collision Avoidance System (TCAS). We are less optimistic about the FAA's progress in the development of a ground based system that will be effective in the non radar environment of oceanic airspace.

We have investigated several near midair collision incidents and operational errors involving airplanes in oceanic airspace. We are aware that the Oceanic Display and Planning System (ODAPS) is intended to assist controllers in the detection and resolution of overwater conflicts. Two systems were supposed to have been operational in 1988. However, we have been advised repeatedly of delays due to software deficiencies. We believe that the FAA should place greater emphasis on the program or fund the development of alternative systems until the problems with ODAPs are solved.

While there has been a great amount of attention given to the airborne collision problem, there has been insufficient attention given to the prevention of collisions on the airport surface during takeoff and landing operations. This constitutes one of the Safety Board's major concerns.

On March 31, 1985, two Northwest Airlines DC-10's nearly collided at the Minneapolis-St. Paul International Airport. One of the airplanes was taking off from a runway after having been cleared for takeoff by the local controller; the other was taxiing across the same runway after having been cleared by the ground controller. The captain of the airplane taking off realized that he could not stop and averted a collision by rotating the airplane and forcing it airborne at a speed well below the normal takeoff speed. The airplane overflew the taxiing DC-10, clearing it by 50 to 75 feet. There were 501 persons aboard the two airplanes, and there were several other airplanes in the immediate vicinity of the taxiway/runway intersection. Had these airplanes collided, the results would have been catastrophic.

The Safety Board's concern about this incident prompted a special investigation of runway incursions. During 1985 and early 1986, the Safety Board investigated 25 more runway incursion incidents which were summarized in a report adopted on May 6, 1986. The Board found that the incursions were the result of both controller errors and pilot deviations. A number of recommendations addressing such issues as controller coordination procedures, training, pilot-to-controller communications and airport signing were issued to FAA.

The FAA accepted many of these recommendations and established a runway incursion task force. However, even with the increased awareness of the problem, runway incursions continue to occur, some of which have resulted in accidents.

On December 15, 1987, an Eastern Airlines B-727 struck a Rockwell Commander 680 while taking off from the Kansas City International Airport. Both airplanes were damaged but, fortunately, there were no injuries. The investigation disclosed that the local controller had cleared the Commander 680 onto the active runway after the B-727 began its takeoff roll unaware that the 680 was positioned partway down the runway for an intersection takeoff.

Similar circumstances occurred at the Boston Logan Airport on November 13, 1988, when the pilot of a Pan American B-727 was forced to lift his airplane off at a below normal speed to fly over a Precision Airline Dornier 228 which had been directed by controllers onto the active runway in front of the departing B-727.

The Safety Board views these occurrences as indicators of a most significant safety hazard. Further, we believe that the potential for an accident will continue to grow as the number of operations at existing airports increase; we cite the FAA's own projection from 61 million operations at towered airports in 1988 to over 80 million operations in the year 2000. We must recognize that human error on the part of pilots and controllers is possible even under the best of circumstances. There must be redundancy provided by automation similar to that which is present to prevent airborne collisions.

The FAA addresses this safety threat in its Research Engineering and Development plan by improved Airport Surface Detection Equipment (ASDE-3 radar) and the Airport Surface Traffic Automation (ASTA) programs. The Safety Board has several concerns about the direction of these FAA programs. One, that the automated systems as currently envisioned will still require controller interaction; two, that the equipment is scheduled to be available at only a limited number of major airports; and three, that the present program appears to be directed toward further study with tangible results not forthcoming until the mid 1990's. In our view the technology presently is available to provide a system that would use ASDE-3 and ARTS radar data as intelligence to detect takeoff and landing operations on active runways which could activate devices to give pilots a direct visual indication of the need to stop before intruding onto the runway.

The Safety Board strongly urges the FAA to place greater emphasis on the R&D efforts which would lead to the earliest implementation of an effective Airport Surface Automation System.

Severe Weather

Since 1970, the Safety Board has issued over 30 safety recommendations to the FAA relating to the severe weather hazard. Most of these specifically addressed the microburst windshear phenomenon that has been identified as the cause of at least four fatal accidents and 438 fatalities since 1973.

The recommendations cited the need for the development of ground based detection equipment, airborne detection and guidance equipment, improved technology to enhance communications between controllers and pilots, and pilot training programs. The FAA has taken positive actions in each of these areas and, in 1986, developed an Integrated Wind Shear Program Plan. The Safety Board is encouraged with the way in which the program was administered. We have now reached the point that much of the R&D effort has been completed and we eagerly await the tangible results of those programs.

The doppler weather radar equipment -- NEXRAD, Terminal NEXRAD, and Terminal Doppler Weather Radar -- all are under contract and should significantly improve timely detection of microbursts. The value of such equipment was proven on July 11, 1988, when a developmental terminal doppler weather radar undergoing a test demonstration at the Stapleton International Airport detected a severe microburst in time for the tower controllers to warn the pilots of five approaching airplanes of the hazard. The advanced warning aided these pilots in avoiding or escaping the hazard successfully.

The Safety Board also notes the efforts that have been taken to improve the Low Level Wind Shear Alert System (LLWAS). The enchanced system, which includes adding 6 or more anemometers to the existing 6 of the original network, will enable the system to identify microburst windshear within the airport boundary and will provide controllers with an intelligible message to transmit to pilots regarding the potential windshear which they may experience on an approach or departure. The Safety Board believes that it is unfortunate that the FAA plans to upgrade only 17 of the 110 LLWAS systems to this enhanced configuration and urges further consideration of this decision.

The Safety Board notes that the ASR-9 installation program that will provide terminal facility controllers with much improved weather information has been delayed, but we have been advised that installation should start imminently. The Safety Board believes that more effort might be needed to train controllers and develop procedures in order to take full advantage of the capability of this equipment.

Despite the progress of the FAA weather programs, pilots will be operating for several more thunderstorm seasons into major airports with the same meager weather information that was available in Kenner, Louisiana in 1982 and Dallas/Fort Worth in 1985. So there is no substitute for pilot awareness and training to cope with the microburst hazard.

The Safety Board believes that the R&D programs must continue, particularly those associated with the Mode S data link needed to develop an effective communication circuit to provide timely warnings to pilots from new ground based weather detection equipment. Such systems may also reduce controller workload.

Human Factors Research

Human factors has long been recognized as an area in need of more intensive research and development. The Safety Board is pleased that the FAA responded to the Aviation Safety Research Act of 1988 by appointing Dr. H. Clayton Foushee as the Chief Scientific and Technical Advisor for Human Factors. We worked closely with Dr. Foushee while he was at NASA and look forward to an even closer association with him in his new position.

Other Aircraft Safety Programs

The FAA's Research, Engineering and Development Plan specifically addresses nine projects on aviation safety including airworthiness, crashworthiness and aircraft operations subject areas. The Safety Board believes that the individual elements of these projects encompass the significant accident causal issues.

Keeping up with state of the art technology undoubtedly is a challenge for the FAA's R&D and aircraft certification staffs. Today more than ever, the aviation industry is into a new era of aircraft design with new materials, microprocessor controlled devices, digital fly-by-wire controls, glass cockpit instrument displays, and sophisticated flight control systems. The FAA is confronted with the certification of airplanes with side stick controllers and fly-by-wire systems, the certification of prop fan propulsion systems and the certification of tilt rotor aircraft.

The R&D of these new technologies is accomplished largely by the manufacturers sometimes with support from NASA. The FAA often finds itself in a position of playing catchup in new R&D initiatives. They need to have a cadre of highly qualified engineering experts and they need the resources and support to attract such people in order to assure that these R&D projects are effective.

Summary

The Safety Board supports the FAA's Research, Engineering and Development Plan. We believe that airport capacity will be the most serious limitation to the safe future growth in aviation operations. The FAA has many programs intended to increase the enroute flow and terminal acceptance of traffic such as the enroute and terminal automation programs, the microwave landing systems, parallel approach monitor and high speed turn offs. The Safety Board is concerned that the risk of collision, particularly during takeoff and landing operations, will increase unless greater emphasis is given to the runway incursion problem and the development of an effective Airport Surface Traffic Automation system. The Safety Board also believes that the Congress, the FAA and the aviation industry must take every opportunity to promote the development of new airports to assure the safe growth of aviation in the 21st century.

That completes my formal statement, Mr. Chairman. Mr. Laynor and I will be pleased to respond to questions.

Aging Airplanes

The FAA and industry position on the life of aircraft has been that airplanes can be operated safety for an indefinite service life provided they are maintained with effective inspection, corrosion control, and repair programs. The FAA has recognized however that the state of present non destructive inspection technology might be limited with regard to the detection of small cracks in airplane structure that may suddenly become critical when several adjacent small cracks join together into a large crack. The phenomena is known in the industry as multiple site damage (MSD).

The Safety Board supports the FAA R&D programs to review failure mechanisms relating to age, fatigue, corrosion, crack propagation, and the delamination of airplane structures, and to develop new inspection equipment that will enhance the ability of inspectors to detect disbonded structure and MSD. We understand that the FAA recently has established a new position for a National Resource Specialist having expertise in non-destructive testing. The Safety Board urges the FAA to give priority to this program.

We also support the FAA's Aviation Standards activities to increase the surveillance of air carriers to determine the effectivness of existing inspection and corrosion control programs and to optimize industry wide corrosion control practices. Similarly, we are supportive of the industry efforts led by the Air Transport Association with the participation of the airframe manufacturers to identify those parts of the airplanes in our fleet which should be replaced or repaired as the airplanes reach a prescribed number of hours flown, cycles or calendar age.

Mr. VALENTINE. Thank you, sir.

I have some questions and you might—some of them you might—the thought might occur to you, well, why does it ask me this, and because you weren't the person involved, and have no personal knowledge, but if you have any insight that you can give us with respect to these things, it would be appreciated.

Mr. KOLSTAD. Certainly.

Mr. VALENTINE. In your opinion, how—how would an experienced flight crew in Detroit, even without a checklist, forget to extend the wing flaps on the airplane before the takeoff? Probably the most basic of flight training concepts.

Mr. KOLSTAD. Mr. Chairman, you're talking about Northwest 255 in Detroit of August of 1987. That accident involved a series of minor disruptions to the cockpit crew during a period prior to the takeoff that we have determined was critical in that this is exactly the time period that the checklist should have been gone over, should have been reviewed.

Also, the design of the checklist on that particular—by that particular airline for that airplane was such that there was no way to determine if you had to leave the checklist at one point, that you had completed the items above it. So beyond that, sir, I don't know.

Mr. VALENTINE. Let me ask you then about checklists. Is the checklist used by most of these crews just what you would—we think of it, as a piece of paper with items to be checked off?

Mr. KOLSTAD. This——

Mr. VALENTINE. Isn't there such a thing as, for lack of a better expression, a contraption used by some airlines that constitute some type of mechanical checklist? It's very easy, I should think, to be going through that routine and have your attention diverted, and you come back and you think you've checked this, and you haven't.

There are such things as inexpensive contraptions that would—you press a button and it would light up or there would be—what can you tell us about that sort of thing? And does the FAA require a special type of checklist of the kind that I'm talking about, or should they?

Mr. KOLSTAD. Well, the FAA doesn't require any particular kind of checklist. The checklist that was involved in the Detroit accident was a card, a plastic card. However, you're quite correct, Mr. Chairman, that some carriers do use a checklist that involves either sliding a blackout screen across a particular item once it's been completed, or an electrical switch is thrown to turn off the power underneath that particular item, or various other methods.

So that the particular problem that existed in the Detroit accident would not occur.

And I believe that the Safety Board has made recommendations—as a matter of fact, we did make a recommendation to the FAA following the Detroit accident with respect to checklists.

Mr. VALENTINE. What was the—what was their reaction to that? Was that one of the recommendations that they adopted?

Mr. KOLSTAD. No, sir, I can't—I can't recall what their—I don't believe that they've responded to us definitively as yet.

Mr. VALENTINE. Wouldn't that be a relatively simple and inexpensive way where at least a little improvement could be made?

Mr. KOLSTAD. It would, Mr. Chairman. You're talking about—you're talking about a routine that each carrier performs somewhat differently. And, again, it's an area of—of the government getting into the cockpit of the airplane.

We do think there needs to be improvements in how the checklists are performed, but we did not prescribe how that should be done, and I don't believe that the FAA has done so yet either.

Mr. VALENTINE. In the problem that existed –the weather conditions in—in Denver concerning the flight crew and the poor weather there, that didn't—well, I'll say that—I won't say what they did or didn't do, but they—some would believe that an inappropriate concern, an amount of concern was displayed about the icing building up on the airplane's wings' surface before, while he was waiting takeoff; a human factor, again.

Was the situation in Denver, in your opinion, similar to that which resulted from the tragic—from the Air Florida tragedy in Washington in 1981?

Mr. KOLSTAD. Mr. Chairman, there were similarities. Inexperience, crew inexperience, was one of the similarities. The first officer had about 3,100 total flight hours in the Continental accident. He had only 36 hours in turbojet aircraft, all of it in a DC–9. It's probable that neither pilot was aware of the particular sensitivity of the DC–9, which the DC–9 series 10 that did not have leading edge devices and, therefore, just a small amount of wing contamination affects the flight aerodynamics of that particular aircraft.

We also, in the Air Florida case, had—had a crew with very limited time; as a matter of fact, no time in snow and inclement weather, of the kind that was—that was—that was found on the day of the Air Florida flight.

The first officer did detect, during the takeoff, that—that there was a problem with the fact that the engines were not developing the correct exhaust pressure ratio; did point it out but not assertively so, at least assertively enough that the captain understood that—that there was a problem.

Back to Denver, we had a problem with management in that they paired two inexperienced pilots together, neither of which had sufficient enough time. And we had a captain who turned over the flying responsibilities that day to a first officer who he had never flown with before. And that first officer over-rotated the aircraft during the takeoff.

Mr. VALENTINE. Given past experience with the evolving aircraft technologies, does the National Transportation Safety Board feel that the rapidly increasing level of cockpit aut—that it will—rapidly increasing level of cockpit automation, will it enhance, or decrease, or have no effect on safety and——

Mr. KOLSTAD. Mr. Chairman, we think that it will enhance safety. We're also concerned, though, that there could be an overreliance on this new sophisticated equipment. So that when the skill and experience level of the pilot is called upon if there is a failure of that equipment, that he may not be effectively able to deal with it.

Mr. VALENTINE. You mentioned a May 1986 NTSB study of airport surface runway incursion.

How many recommendations did the Board provide to the FAA, and how many were adopted?

Mr. KOLSTAD. I think we provided 18 recommendations.

Mr. LAYNOR. Fourteen.

Mr. KOLSTAD. Fourteen? And how many——

Mr. LAYNOR. Well, we provided 14 recommendations to the FAA, and of those, 11 we have closed with acceptable action, three we have not. But we have since communications with the FAA, we have an understanding that two of those have been accepted. So that there really only remains one that we feel they didn't act on, and that was kind of an administrative recommendation. It regarded the reporting of runway incursions and the level of investigation that was conducted as a result of that reporting.

But those recommendations that dealt with the controller coordination, coordination between local and ground controllers, the communications between pilots, training, and awareness, the FAA has—has acted on—on just about all of those.

Mr. VALENTINE. So did I understand you to say they had adopted all but one?

Mr. LAYNOR. The FAA has acted in some way to permit us to evaluate their actions as acceptable on—on all but one of the recommendations, yes, sir.

Mr. VALENTINE. Do you gentlemen believe that the FAA's Runway Incursion Task Force is producing effective runway incursion prevention strategies?

Mr. LAYNOR. Well, the FAA established a Runway Incursion Task Force and the Task Force was broad scope within the FAA and involved people from the air traffic community, people from the R&D community, flight standards, just about everybody who could play a role in aviation and runway incursions.

The task group coordinated some of the activity of—of getting changes to the controllers manual, for example, so that a ground controller has to acknowledge to a local controller that crossing of an active runway has been completed. There has been changes to the Airmen's Information Manual regarding recommended practices in communications with pilots. There's—there's been any number of changes, including one of the recommendations that—that the FAA acted on belatedly, and we—we had initially closed it as unacceptable, but have reclassified it, was the development of a tower cab simulator in their controller training program. They've just gone under contract with—with a company to develop a simulator which can give controllers active training in a fairly realistic environment and where they can simulate such things as runway incursions to test the controller's actions and alertness.

Mr. VALENTINE. Most people, I think, can understand the—the problem which results from congestion around airports as water in a funnel. But I—would you tell us—talk to us a little bit about the rationale behind your concern about runway incursions.

Mr. LAYNOR. Well, we're very much concerned, as Chairman Kolstad said in his opening statement, there—there are accidents, or incidents, that continue to happen. We're—we're privileged to the Administrator's daily bulletin and-and seldom a day goes by that we don't see some type of runway incursion at one of our airports; not always a major airport, but at one of the airports. And it—it

often involves pilot deviation and even air carrier pilots who—who mistakenly understand clearances and cross onto an active runway, or cross an active runway, or they're not aware of the taxi routing at the airport. They continue to occur.

Just most recently, up in Boston—I forget exactly when it was—but we had a—a Pan—Pan American 727 cleared for takeoff, and the controller did not realize that there was a commuter airplane that was sitting at an intersection down the runway waiting for takeoff, and he cleared that airplane to follow the departing 727.

The pilot of the 727 rotated the airplane and into the stick shaker regime, into the stall regime, and held it there for several seconds as he crossed the bubbadornier. These incidents frighten us and—and the thought that the capacity at these airports are going to be increasing with the—into the next decade. And with—without a lot of new airport development, the funneling, as you call it, is going to put more and more airplanes onto the surface and we feel like it's a real problem.

Mr. KOLSTAD. Mr. Chairman, let me add to that, that sometimes safety issues occur because of an accident that—that calls attention to them, like Kenner, like JFK, like Dallas. These are three wind shear accidents.

And as a result of those accidents, there was a tremendous amount of—of effort on behalf of—of industry, on behalf of government, to try and address the problem of microshear windbursts.

The same thing has not occurred with respect to runway incursions. There have been no serious runway incursion accidents——

Mr. LAYNOR. Except Tenerife.

Mr. KOLSTAD. Except for Tenerife, which still remains as the—as the world's worst accident in terms of fatalities.

So part of our concern is the fact that up until the Runway Incursion Task Force, there, frankly, hadn't been a lot of activity by anybody to address this issue.

So we're very pleased to—to see the work, and to participate in the work of the Runway Incursion Task Force, and are giving this subject more attention internally.

Mr. VALENTINE. The fact is that the air controllers, where they have access to approaching and departing aircraft—they can pick them up on their equipment. But they don't have—with the present equipment, they don't have that contact with airplanes that are moving and taxiing from place to place, and they rely on visual contact, don't they?

Mr. LAYNOR. Well, a number of airports are presently equipped with airport detection/surface detection equipment—ASDE equipment, in ASDE-2 has limited capability. But that can be used by the controllers. It's generally used in—in weather in which they do not have a good enough view outside their cab—cab windows to detect the movement of traffic, but it can be used.

Now, part of the FAA's R&D plan, the existing plan that you're considering today, involves progression of that equipment into the ASDE-3 equipment, and the FAA also has a—a program that is being funded for the first time this year, which is the Airport Surface Traffic Automation Program.

We're concerned that that program hasn't been moving—moving ahead at the pace that it should with the other capacity improving

programs that are—have been ongoing. So we'd like to see—see a considerable amount of more effort in that. It's—it's possible to piggyback onto some of the ASDE–3 capability to come up with, we think, with a workable system that would—would not only provide controllers, but also provide pilots with an indication that they are about to taxi onto a runway that has departing or arriving traffic.

Mr. VALENTINE. I have one more question, maybe a two-part question. But before I get to that, which deals with the same thing that we're talking about, but until we get—make use of new technologies, the situation now is, as I understand it, that on a—these air controllers are up in the tower, and on a—a foggy day they—all the contact they have with airplanes moving around on a big airport such as O'Hare, with, what? six runways—many of—several of them crossing. All they have is—is voice contact. They don't have any way in the world to know what's moving around, what might be crossing a runway of an incoming airplane, do they?

Mr. LAYNOR. Well, the ASDE radar does have that capability. They don't have the capability of identifying what airplane it is that might be located in a certain point on the airplane—the airport—from that radar. But they do have the—the capability of monitoring airport detection—airport surface detection equipment radar in inclement weather. They don't use it very much in clear weather because their—their job is to look out the tower cab and keep the—the traffic in sight, and——

Mr. VALENTINE. If they can see it?

Mr. LAYNOR. If they can see it.

Mr. VALENTINE. Given the fact that the technology exists, which you have described, to the best of your knowledge is there an FAA R&D project which is exploring the application of this available technology to this very problem that we're talking about?

Mr. LAYNOR. Well, there is—there is a program, the ASTA—the Airport Surface Traffic Automation program is, as I mentioned, being funded this year. We're a little bit concerned about the emphasis being given to the program and the direction that it—it might be going. It appears, if our understanding is correct, that it's a—the FAA is about to go under contract with—with one company that might lead to more study and—and something coming along a few years down the stream.

We think that—we know that the manufacturer ASDE–3, Norden, and Lincoln Labs, and Mitre, are all—are all have a part of the program and are working on it. We—we are a little bit concerned that ASDE–3 might be delivered without the computer capacity that would be needed to introduce a runway intrusion module, that they're calling it, into that equipment, which if it did have that capability it might expedite the—the downstream implementation of some—some pretty good equipment.

We think—we think the equipment is needed also to provide something like a traffic light system at the intersections. We're not convinced that alerting a controller to the fact that an airplane's about to cross a white line onto an active runway in time for the controller to digest the problem and make a transmission is—is necessarily going to be adequate.

We're also concerned that ASDE–3 is only going to be—is only programmed to be installed at 30 airports.

Mr. VALENTINE. Mr. Lewis?

Mr. LEWIS. Thank you, Mr. Chairman.

Do you think, Mr. Kolstad, that FAA is undertaking a sufficient research and development in the areas that you've been discussing, and human factors, and a number of others, do you feel that it's adequate?

Mr. KOLSTAD. Mr. Lewis, we haven't specifically quantified the degree or the amount of research that's going on. As a general matter, more is always better than less.

Mr. LEWIS. It's what, sir, I didn't hear.

Mr. KOLSTAD. I said, as a general matter, more is always better than—than less. In terms of whether it's enough, we would—we would always like to see more. Whether that's realistic, given the other budget pressures on them, I don't think we're prepared to—to say.

Mr. LEWIS. Well, the plan that you're going to come forth with, that basically will give your outline of your research and development program, wouldn't it?

Mr. KOLSTAD. I'm not sure that I understand. Our plan? Could you repeat the question Sir?

Mr. LEWIS. Well, aren't you supposed to have a—okay, let me rephrase that question again.

There—there will be a plan, FAA will be coming forward with an R&D plan?

Mr. KOLSTAD. Yes, sir.

Mr. LEWIS. And you will be able to comment on that?

Mr. KOLSTAD. Yes, sir.

Mr. LEWIS. Have you seen that plan yet?

Mr. KOLSTAD. No, sir, we haven't.

Bud, go ahead.

Mr. LAYNOR. Well, we've seen the draft plan. We've seen the draft plan and we—we also had representation at the meeting that the FAA had in downtown Washington a few months ago to invite industry comments to the—to the draft plan.

We have not gone through the plan from the aspect of taking the—the funding that's—that's devoted, for example, to those programs that have human factors overtones and comparing it to the—the funding that's going into the National Airspace System Plan projects, if that's what your question is.

Mr. LEWIS. Apparently the data indicates that about 60 percent of the accidents we have are human error type of accidents.

Mr. KOLSTAD. At least, yes, sir.

Mr. LEWIS. And what kind of input do you have into the plan for the human factors research that in order to reduce certainly a significant—this number significantly?

Mr. KOLSTAD. We have significant contact with—with the new human factors representative. As a matter of fact, it was Dr.—Dr. Foushee was the person that we recommended for the position. We know him, we've worked with him. We have a close working relationship. So we feel very comfortable with that—with that association and with our input into the human factor efforts at FAA.

Mr. LEWIS. I see.

Do you feel that FAA does have a responsibility for research into the human factors area?

Mr. KOLSTAD. Yes, sir.

Mr. LEWIS. How about into fire safety and to the geriatric aircraft?

Mr. KOLSTAD. Definitely.

Mr. LEWIS. Definitely.

Over the—do you think that we should have a—a crash program type of situation in order to—in our research area, to try to reduce post-crash fires?

Mr. KOLSTAD. Do you want to comment on that?

Mr. LAYNOR. Well, we've been following the—the activity of the FAA in their crashworthiness programs for a number of years. I think basically we're pleased during the last few years with—with a number of the steps that have been taken. The—the fire blocking seat material in our Part 25 airplanes and also in commuters, and which I guess are also Part 25 airplanes. But the—the fire extinguishing capability inside the airplanes with—with Haylon fire extinguishers, the fire detection equipment in laboratories—lavatories—have all been—been—we've supported and we're very pleased to see those coming.

Dynamic testing for aircraft seats. The recent accident of Boeing 737 over in Great Britain was the first accident that—of an airplane that was equipped with what we call the 16-G seats—seats that were tested to dynamic test standards. And there's a great deal of activity ongoing in that investigation to look at the performance of those seats in that accident. But—but they're all positive measures.

The recent introduction of fire standards for cargo compartments as well as cabin compartments were—we've been following the activity at the Technical Center for a number of years. And I think we're basically pleased.

Mr. LEWIS. Do you think that we should increase the level of funding for research into the area of fires and post-crash fires?

Mr. LAYNOR. I—I can't respond to that, Mr. Lewis, because I'm not—I haven't studied the level of funding that's—that's presently devoted to that.

Mr. LEWIS. You're the fellows that come up with the—the results that cause the tombstone technology type of applications because after your findings then something is usually done. I understand that.

Do you feel that with the fire blocking material that we have right now, and I think it was a good example with the accident we had in Dallas, in which the aircraft developed a—the aircraft was equipped with a fire blocking—new fire blocking material, that they did have about 2½ minutes in order to get out—evacuate that aircraft, and they did, except the 12 people in the back and, unfortunately, the door prevented that from happening.

Do you think that we should be looking at increasing that fire block time to, say, four minutes?

Mr. LAYNOR. Well, I think there's been a number of tests that have been—been accomplished to—to probably show that—that's an optimum time from the standpoint of practical application of fire blocking technology and optimum from the—the extent that those passengers who remained ambulatory can evacuate the airplane, it—it enhances their opportunities.

I—I wouldn't want to comment on, you know, more is better, but there becomes trade-offs, I'm sure.

Mr. LEWIS. I have another question here.

Well, I guess, Mr. Chairman, a number of my questions that these gentlemen are not going to be able to comment on. I'd probably be asking the wrong people.

But maybe you can tell me—tell me this, on aircraft maintenance and you're called into these problems on occasion when we have an accident, what determines a one-time occurrence and what determines a reoccurring problem?

And I—I want to—I want to revert back to the 737 door latch problem.

Mr. LAYNOR. The——

Mr. LEWIS. On the one—on the New Zealand where we lost a door, we lost nine people out of the aircraft.

Mr. LAYNOR. That was a 747.

Mr. LEWIS. 747——

Mr. LAYNOR. Yes, sir, it was United Airlines 747. Of course, that's under very active investigation where——

Mr. LEWIS. You'd rather not say?

Mr. LAYNOR [continuing]. Where while we're anticipating having a public hearing to discuss the circumstances of that later this month.

Mr. LEWIS. Okay, okay. Let me just ask you the question: Take any accident, or take any—what determines a one-time occurrence and what determines a reoccurring problem as far as you're concerned? And how is that determined?

Mr. LAYNOR. Well, certainly when an accident occurs, as we get involved in the investigation, one of the first things that our—our people do is look at FAA's Service Difficulty Reporting program to determine whether there have been any—any previous indications of a problem that might—or any service bulletins put out by the manufacturer, or anything that would indicate that there—there has been a history of that type of problem with—with that particular airplane. We get very much involved in that.

As the investigation is completed, we have to make an assessment of whether it's a problem that was unique to a combined set of circumstances on the accident in question or whether it's a problem which can be recurring, whether it be a human performance problem or an equipment problem. We try to make that judgment. And where we think that there is a potential for other flight crews or other airplanes to have that problem, we—that's when we make urgent recommendations to the FAA and—and we also advise industry of our concerns through the Air Transport Association. And, of course, all those people are—are often members of our investigative team. And there's generally action; action taken fairly quickly.

Mr. LEWIS. Do you—you say you—after your investigation that then you recommend to the industry as well as to the FAA that some action be taken?

Mr. LAYNOR. I think most of our recommendations have been addressed to the FAA, and those that apply to industry have been addressed through the FAA's oversight programs through their aviation standards.

Now, for example, if a problem has to be—if—if the air carriers have to change an operating procedure or have to review an operating procedure, the easiest way to accomplish that is through the principal operating inspectors of the FAA, working with the air carriers directly, to assure that they—they do comply.

We often have—we have very frequent discussion with the—the safety personnel in all of the major air carriers; less formal, but very frequent communications. In fact, almost immediately after an accident we'll start getting telephone calls from—from vice presidents of operations or—or safety in the air carriers to find out if it's anything that they should be concerned about. And we do—we do pass that word.

Mr. LEWIS. I guess what I'm really trying to find out is after you have an investigation and you've completed that investigation after a particular accident, and you have recommendations, where do those recommendations go? To the carrier and to the FAA?

Mr. KOLSTAD. They go—Mr. Lewis, they go to anybody that we feel can address the problem. And the same problem may be addressed to a number of different people, like the FAA, like the Air Transport Association, like specific carriers.

I—I wouldn't——

Mr. LEWIS. I guess, Mr. Kolstad——

Mr. KOLSTAD. I'm sorry.

Mr. LEWIS [continuing]. What I'm trying to find out is just how much weight your recommendations have and just what is done. If you say that, you know, this particular problem is detrimental to flight safety and we—do you say that—who's to say that that problem is going to be fixed within a minimum amount of time or the airplanes are grounded?

Mr. KOLSTAD. But they have——

Mr. LEWIS. See, I don't think you're saying that to me.

What you're saying—you're telling me a lot of words, that you're giving a lot of recommendations and a lot of people are going to look at this thing and we're going to have accidents and nothing's done about it.

Mr. KOLSTAD. Well, Mr. Lewis——

Mr. LEWIS. Over long periods of time.

Mr. KOLSTAD. As you probably are aware, we have no enforcement authority.

Mr. LEWIS. I understand that.

Mr. KOLSTAD. So we can't mandate that these recommendations be undertaken. But in fact, approximately—75?

Mr. LAYNOR. I can't——

Mr. KOLSTAD. Seventy-seven. I think it's 75 to 77 percent of all the recommendations that we make to FAA are accepted. And one of the reasons for that, of course, is that we also advise the Congress when we make these recommendations and we advise the—the public. And when we see a particularly severe problem—and we have a follow-up program, and it's a very—a very aggressive one. So it isn't just a matter of issuing a recommendation and then forgetting about it.

We want to know why they haven't followed it. What they're doing about it; if they intend to follow it. And we keep a status of it.

Mr. LEWIS. I'd like to pick out a particular incident but I—and the 747 is the one I want to use and I don't want to use that because you're not going to tell me anyway, and I don't want you to tell me at this point in time. But let's—let's take into——

Mr. LAYNOR. I think we can——

Mr. LEWIS [continuing]. Consideration that you have a problem with the 737 and you—you have a problem with the gear mechanism on the right flap, and that caused an accident; and it caused a ground accident, not even an air accident if you want to say it. No, I guess you'd have to have an air accident.

But, nonetheless, in your opinion, that had to be rectified immediately or all 737s would be grounded. Who's going to do what?

Mr. LAYNOR. Well, first of all, I'll back up and I—I think that it's appropriate to address your problem on the 747 cargo door. The—without a recommendation from the Safety Board the FAA took immediate action to—to enhance the—the positive confirmation that—that doors are properly latched on the 747 aircraft following that accident. But there were——

Mr. LEWIS. But they also gave them two years to change the latch on the first failure; correct?

Mr. LAYNOR. The—well, that's—that's in fact true. But this—this positive latch is by using a—a visual window which can—can look positively at the position of the latch sectors on the latching pins; a procedure which was not employed before that accident. Before that accident we were relying on other indications that a door was latched, that were less positive than that—that visual indication.

But immediately following the accident, there was action taken to—to provide greater confidence of—that the doors were—were in fact latched fully.

In the—in your—your question about the 737, during the investigation and, once again, we have—the FAA participates with us in all of the major accident investigations. They have representatives on all of our—our accident teams: the airworthiness teams, the operational teams, and so forth.

So we're not in isolation when we detect that there's a problem that needs immediate action. Oftentimes we will put out a recommendation, and many times it's done within a day of the accident. As soon as we learn of something that's—that's an indication that there's a problem—I can use the DC–10 accident in 1979, Chicago, as an example. It was an engine pylon failure. And it was immediately obvious from the nature of the accident that there was a problem with the engine pylon. Within—within hours of the accident, there was an airworthiness directive put out against that airplane to—to visually inspect the pylons without knowing where the failure occurred even, but knowing that it was in that—that portion of all the DC–10 fleet.

Those kinds of recommendations, which we classify as urgent, the FAA, almost invariably, takes action on very, very quickly. Sometimes they take action before our recommendation gets to them.

Mr. LEWIS. On this 747 and door latch problem, are any inspections of a—of a representative sample of the 747s flying taken to determine a percentage of 747s with this door latch problem, or are you looking at all of them?

Mr. LAYNOR. Well, we haven't—we haven't identified the problem that existed because the accident is still under investigation. The actions that were taken were actions which would—would provide greater confidence irrespective of the problem that existed—may have existed on the—the United aircraft.

But in answer to your question, the doors are being inspected and it is a fleet-wide——

Mr. LEWIS. Now when you do that, is that, at the next inspection, is that—is that immediately or is that when the airplane lands at—at the next station? How do you handle that?

Mr. LAYNOR. It depends on the severity of the problem, where——

Mr. LEWIS. I think this one's quite severe.

Mr. LAYNOR [continuing]. Where there's—well, that was—I can't respond to—to that—that particular airworthiness directive that went out against the 747. But, of course, that's a daily operation or a flight operation, opening and closing the door. So as soon as that airworthiness directive became effective, there—there were procedural changes to—to confirm that the door was latched. And where a serious airworthiness problem is identified, for example, the DC-10 pylon—pylon, or fuselage structure problems, if it is deemed critical to further flight and we feel like there's—there's airplanes flying today that might have that problem, it—it quite often goes out before further flight.

Now, sometimes there's a—a relaxation to permit the airplane to fly from wherever it's presently located back to a maintenance base that has the capability of—of doing the maintenance. But that's about the extent of it.

Mr. LEWIS. Well, I'll just ask one more question, Mr. Chairman.

Let me go back to the DC-10 in 1979.

How—how did the—how did we inspect the engine pylons on DC-10s at that time when we killed over 300 people and—were the DC-10s' all engine pylons inspected within 24 hours, 48 hours, or the next inspection six months from then, or when they got around to it?

Mr. LAYNOR. No, that was done immediately. In fact, there were airplanes that—that were—were located—I recall specifically that there were two airplanes in Bermuda that had a problem and the carrier was—was concerned about how to get those airplanes back to a maintenance base.

Now, that problem, you may recall, was—was a problem that—that had to do—was determined ultimately with—with the maintenance procedure.

Mr. LEWIS. There they're using the forklift to get the engine up and bumping it up and they were racking it and crack—I'm familiar with the accident, that's why I'm asking you.

Mr. LAYNOR. You may recall also that the entire DC-10 fleet was—was subsequently grounded for a certain amount of time.

Mr. LEWIS. That's what I wanted you to say. And I'm having a hard time getting you to say that.

Okay, thank you very much.

Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, gentlemen.

Mr. KOLSTAD. Thank you, Mr. Chairman.

Mr. VALENTINE. Panel number 1 on the airports I've already introduced these gentlemen: Mr. Reilly and Mr. Poritzky. We'll hear from you at this time. Welcome. You—your prepared statements will appear in the record and you may summarize or otherwise proceed.

STATEMENTS OF J. DONALD REILLY, CHAIRMAN, INDUSTRY TASK FORCE ON AIRPORT CAPACITY IMPROVEMENT AND DELAY REDUCTION, AND SIEGBERT B. PORITZKY, VICE PRESIDENT, TECHNICAL AND INTERNATIONAL AFFAIRS, AIRPORT OPERATORS COUNCIL INTERNATIONAL

Mr. REILLY. Thank you, Mr. Chairman. Good afternoon.

I'm J. Donald Reilly, Chairman of the Industry Task Force on Airport Capacity Improvement and Delay Reduction.

The Task Force is comprised of 25 representatives of all segments of the industry: airlines, pilots, controllers, airports, general aviation, manufacturers, and several outside experts.

Mr. Chairman, I'd like to submit our statement for the record and if I may just take a couple of minutes to briefly review it for you at this time.

Mr. Chairman, Mr. Lewis, certainly one, if not the most, serious problem facing the U.S. civil aviation today is a growing lack of airport capacity. We presently have some 20 major airports experiencing severe capacity constraints. This number is expected to grow to 40 by the year 2000.

The cost of delays today is estimated at $3 to $4 billion per year. It will be impossible to build the 6 to 10 new airports needed in the United States by the year 2000, and will be impossible to build the 50-plus needed new runways at existing airports because of various physical constraints or environmental opposition.

Therefore, we feel it is imperative, both for near and medium term capacity improvements that we vigorously pursue the third alternative we have: initiatives for more effective and practical use of current airports. These initiatives that we pursue offer the least expensive approach, will produce the fastest capacity returns on investment, can provide average capacity increases of 20 to 40 percent based on an airport's local circumstances, can help bridge new airport capacity needs to the year 2000, and as importantly, have—has the support of the industry and FAA.

The nine main initiatives the Task Force has focused on, which will help provide significant capacity improvements, are outlined on pages 5 and 6 of our statement. These initiatives and the full FAA funding required to develop, simulate, install, and demonstrate them are supported by the entire industry.

In general, Mr. Chairman, the Task Force initiatives, very briefly, include:

Development of more accurate, readable sensors which can permit independent IFR closely spaced parallel and converging runway operations;

Procedures for introduction of triple and quadruple runway simultaneous operations;

Development of needed terminal automation;

Wake vortex detection and avoidance;

Airport terminal area simulation model development and validation;

Development of cockpit traffic displays for the use of pilots;

Improved airport surface visual controls;

Development of airport surface traffic automation; and,

Airport capacity enhancement planning and analysis.

A minimum of $33.1 million in fiscal year 1990 R&D funding is needed for these nine important programs.

In addition, we believe $4 million is necessary to conduct meaningful airport-related R&D to enhance the safety and for the product improvement of FAA's major AIP investment in runways and pavements.

And we believe a small amount of R&D money—about a half a million dollars—should be devoted by FAA to the development of new airport capacity ideas and concepts.

Further, Mr. Chairman, we strongly believe that approximately $5 million of additional FAA operations funding is required to conduct planning and development analysis to assure optimal operation of the FAA system by funding application of appropriate airport and system capacity and analytical tools, including supporting individual airport-specific capacity improvement task forces.

If this $5 million is not available from FAA operations funding, then we strongly support its addition to the R&D monies.

These important projects I have just noted total $42.6 million. Mr. Chairman, this total represents only $17.6 million in new money over the $25 million FAA has already requested in its R&D budget for application to these programs.

We urge your subcommittee's approval of the addition of the $17.6 million in new money as I've outlined, for a total airport capacity program funding of 42.6 million in fiscal year 1990.

In closing, Mr. Chairman, we feel that much capacity improvement can be achieved through the initiatives I have described. But the above needs will require that FAA's fiscal year '90 and '91 budgets also provide for acquiring some 10 precision runway sensors for about $50 million to begin the implementation of these concepts.

We believe this need must also be favorably considered by Congress.

Mr. Chairman, that is a quick, brief summary of the presentation. I'd be happy to respond to any questions.

Mr. VALENTINE. Thank you, Mr. Reilly.

[The prepared statement of Mr. Reilly follows:]

INDUSTRY TASK FORCE ON AIRPORT CAPACITY IMPROVEMENT AND DELAY REDUCTION

Comments

before the

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

of the

HOUSE SCIENCE, SPACE AND TECHNOLOGY COMMITTEE

by

J. Donald Reilly
Industry Task Force Chairman

April 11, 1989

* * *

One of the most serious problems facing U.S. civil aviation today is the lack of airport capacity.

Some 20 major airports now face severe capacity constraints. Barring significant levels of new capacity, the number of capacity constrained airports is expected to grow to 40 by the year 2000. The cost of delays is now estimated at $3 billion to $4 billion per year. Yet passenger growth is expected to double by the year 2000.

Query: If we cannot handle today's passenger volume, how will we ever handle the anticipated doubling in demand on the system by the year 2000?

There are only a few cures to our national problem of inadequate airport capacity:

1. Build new airports - at least 6 to 10 new airports are needed in the U.S. in the next eleven years;

2. Build new runways - at existing airports probably some 50 new runways will be needed;

3. Expedite new technology and procedures to make existing airports and runways as efficient as possible.

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Unfortunately, the chances of building even three major new airports in the U.S. by the year 2000, are dim to nil; and the chances of building the number of required new runways at current airports appears impossible due either to airport physical constraints or local environmental opposition.

Therefore, it is imperative that we vigorously pursue the third option -- initiatives for more efficient use of current airports -- as energetically as possible. These initiatives offer the least expensive approach, will produce the fastest returns on investment, can provide capacity increases of 20% to 100% based on an airport's local circumstances, and has the support of most all individuals in the industry.

Past Congressional Action

The Industry Task Force on Airport Capacity Improvement and Delay Reduction (list of members attached) appreciates the recognition given by Congress to the serious and growing problem of limited airport capacity. We are grateful for the actions taken by the last Congress which:

a) provided in the FAA Research, Engineering & Development authorization that FAA must spend at least $25 million annually for airport capacity enhancement initiatives;

b) defined for FAA the kinds of projects which Congress considers to be responsive to the need to use achievable technology to create additional airport capacity (Att. 1 reproduces the Congressional language);

c) specified several of the most important tasks which must be completed by FAA in a timely manner, and requested timely reports of their status; and

d) added $5 million as part of the FAA FY-1989 appropriation which was greatly needed to help FAA expedite this work.

Help for FAA

o Center-of-Technology Expertise

It is not a secret to any knowledgeable observer that FAA, in its difficult budget situation, has not been able to assign adequate funds or people to this difficult area of work. For some years the NAS Plan has absorbed virtually all of FAA's energies, leaving little for other pursuits. While the NAS Plan is essential to modernize the air traffic control system, it will not solve aviation's problems if air traffic continues to be backed up because of inadequate airport capacity.For many reasons FAA simply does not have the critical mass of internal expertise to carry the essential projects forward. The Industry Task Force, recognizing this problem, last year urged Administrator McArtor to establish a major external center-of-expertise with consistent funding and specific accountability for results in a

given time with given funds, supervised by high level FAA managers representing both engineering and operations/safety disciplines. While this has not yet happened, we are pleased to see that on several of the most important efforts single, highly competent contractors are now in place.

- o FAA Coordination of Airport Capacity Improvement Progress

  Airport capacity projects almost inevitably require close cooperation between at least three of FAA's executive directors and a clear vision of priority and approach. We believe it is time for FAA to rejuvenate and give strong effect to the FAA Airport Capacity Program Office, to give it the charge to reach top FAA management, to have responsibility and accountability for priority setting and to assure that airport capacity projects which meet the need are properly carried out.

  In this respect we applaud the FAA for its recent action in creating an internal airport capacity policy steering group with representation from the four FAA line organizations, including R&D, operations, air traffic, flight standards, F&E, and prominently, the Airport Capacity Program Office.

FAA's Administrator McArtor's 1988 Assessment of the Need

It became clear a year ago to the Industry Task Force on Airport Capacity Improvement and Delay Reduction that it was not sensible to simply propose budgets and projects for R,E&D, but that it was necessary to call for completed projects and accomplishments, realizing that results would involve people and funds and commitments from several FAA elements. The Industry Task Force, early in 1988 asked FAA Administrator McArtor for his estimate of what it would take to bring the primary Task Force-recommended projects to first operational implementation.

On April 21, 1988 FAA Administrator McArtor provided FAA's "estimates of the total funding and time required for first operational implementation, as well as a funding breakdown for each of the twelve objectives" identified by the Task Force (Attachment 2).

The total funding required to bring the projects to first operational implementation was $276.5 million, over a time frame to bring the projects to first implementation ranging from 1 to 8 years, with a five-year average time for all the projects. Spread evenly over the 5-year average time, the funding required would be $55.3 million per year ($31.5 million R&D, $23.4 million 'other'). If the expedited time of three years average, as urged by the Industry Task Force, were used, $53.3 million of R&D plus $39 million 'other' funding would be needed each year. These amounts do not include F&E funds beyond those needed for the first implementation. Nor do they include funds for other worthwhile capacity R&D work beyond that identified specifically by the Industry Task Force.

Definition of What Airport Capacity Enhancement Projects Are

A great deal of FAA's R&D work contributes in one way or another to the achievement of capacity, and it is therefore easy, in constructing and justifying a budget, to include under the heading of airport capacity R&D anything that impacts it, even inferentially. Further, in looking at budgeted amounts and the necessarily brief and often vague descriptions, it is difficult to tell how much of the budgeted amount will be used for the Federal payroll and plant, how much for study and analysis, and how much to actually completing a specific project to achieve new capacity. Only detailed study with FAA managers will produce a meaningful assessment.

In selecting the elements of needed effort the Industry Task Force chose to concentrate on tasks which show promise of yielding increases in the direct, intrinsic, maximum achievable capacity of an airport complex. (This selection casts no negative reflection on other necessary FAA R&D work, but identifies the tasks which are considered to have the highest payback in terms of direct, full-time airport/terminal area capacity).

The specific recommendations of the industry through the Industry Task Force have emphasized tools and procedures for the reduction in lateral or longitudinal spacing requirements, tools to permit the reduction in required wake vortex spacing, the ability to provide independent arrival or departure streams, and the ability through automation to reduce inter-arrival variability. These projects will provide direct capacity increases essentially full time, right at the cutting edge where the requirements are.

DOT/FAA FY-90 Request for Capacity Work

For FY-90, we understand that FAA is requesting a total of $25 million for R,E&D under its "System Capacity and Airports" heading, plus some additional funding under other FAA R,E&D headings, vis a vis its FY-89 request of $20.779 million (to which Congress added $5 million to emphasize its commitment to solving the airport capacity problem). We understand also that FAA is requesting F&E funds in the amount of $53.6 million over two years for ten new radar sensors needed to achieve major capacity gains at the most congested airports. Unfortunately, the $25 million-plus request covers work which, though worthwhile, does not fully carry out the needed tasks to achieve capacity gains as the Industry Task Force has defined them. It includes much work which does not meet the Congressional or the Industry Task Force definition. For example, it includes $2.5 million for development of the National Airspace System Performance Capability, $.66 million for Airport Safety Planning, $.66 million for Airport Safety Support Systems, $2.08 million for Airport Pavement.

Many of these efforts are no doubt worthwhile, but they belong in different categories. As noted below, airport operators feel that airport pavement work is essential, has been short-changed for years, and deserves the emphasis given in Attachment 3 (and funding at approx. $4 million vis a vis the $2 million being requested), but it does not belong in the category of airport capacity projects.

We believe the material in the DOT/FAA budget presentations is, as always, many months behind the current situation. The descriptions and numbers are not fully revealing, and we are aware that FAA is trying to streamline and improve its own internal processes to assure that its project in practice respond to the needs. A highly valuable recent effort by the MITRE Corporation for FAA lays out clearly what can be achieved, the necessary improvements, and the obstacles in the way. A summary of that work, used by the Industry Task Force and airport operators in their considerations, is given in Attachment 4.

Recommendations for FY-90

The funding requirements (Attachment 2) candidly laid out by Administrator McArtor in 1988 (a minimum of $55 million/year total funding for at least five years to accomplish the projects identified by the Industry Task Force) remain the best indication of the real need.
It is time to recognize that we are embarked on a major effort which unfortunately requires adequate funding.

Additional funding is required by FAA for continuing operations analysis, for other vital FAA activities, and for airport design and pavement work, but should not be confused with needs for work in airport capacity technology. Additional funding is required for tasks which have an impact on best utilization of the terminal airspace and airports, but which are beyond those identified by the Industry Task Force. **Considering the budget constraints, we urge that Congress appropriate funds (and earmark them specifically for airport capacity technology by the definition given above) as follows for FY-90 for the most essential capacity technology work identified by the Industry Task Force:**

Completion of Development, Installation, Demonstration, Procedure Development and Validation of High Data Rate and Medium Data Rate Sensor Systems for Closely Spaced Parallel and Converging Runway Reduced Minimums Operations	$8.0 million
Airspace Procedure Development, Simulation, Validation and Demonstrations for Triple/Quadruple Runway Simultaneous Operations, Reduced Minimums Converging Operations, Wet-Runway Reduced Minimums Operations, Establishment of Criteria and Specific Achievable Minimums Benefits from MLS Precision Curved/Segmented Approaches and Departures	$4.0 million
Development and Validation of Terminal Automation Tools for earliest possible stage by stage implementation of a terminal operations planner, by 1992	$8.0 million

Reduction of the Capacity Reducing Impact of Wake Vortices, through development of automatic dynamic spacing adaptation, development and validation of wake vortex detection and avoidance sensors and renewed efforts at elimination of wake vortices at the aircraft source.	$4.0 million
Simulation Model Development and Validation	$2.0 million
Development and Validation of Minimum Performance Standards and Procedures for safe use of cockpit traffic displays in terminal operations	$0.4 million
Airport Surface Visual Control (Lighting) to permit efficient taxiway exit operations, development, validation and procedure development for stop bars and hold-short systems for runway entrances and ends	$1.2 million
Airport Surface Traffic Automation, utilizing earlier research and development to develop and demonstrate an airport surface surveillance, guidance and control system, implementable in steps and using the technologies used in the airspace system where practical	$4.0 million
Airport Capacity Enhancement Planning and Analysis	$1.5 million
	$33.1 million

This amount is the minimum need for a concerted attack on the capacity problem. Little if any of this is research; virtually all is development.

In addition, approximately **$5 million** of additional FAA Operations funding (or alternatively, R,E&D) is required to conduct planning and development analyses to assure optimal operation of the FAA system, by funding application of appropriate airport and system analytical tools, and supporting airport-specific capacity improvement task forces.

A minimum of approximately **$4 million** of additional R&D funding is necessary to conduct meaningful airport-related R&D, to enhance safety and to provide for product improvement on FAA's major investment in runways and pavements. (A proposal for well-focussed priority FAA R&D in this field has been prepared as noted in Attachment 3).

Virtually all the recommendations contained in this material deal with ideas and concepts which are well understood and which require energetic development and

implementation. We believe a small amount of money should be devoted to the development of new ideas and new concepts by advanced thinkers in the field, and propose that Congress earmark **$0.5 million** for this purpose.

Major progress on several capacity-generating concepts has been made through activities of the FAA Air Traffic Service. It is essential that these experts remain deeply involved in this work, operating through the management oversight group recommended above.

F&E funds will be required to achieve the gains promised by the R&D projects. Most of such funds have not yet been requested, but the above needs require that FAA's FY-90/91 request for $53.6 million for 10 precision runway monitors will be favorably considered by Congress. We believe further that Congress must provide funds to permit FAA to lay the base for wise procurement of the Microwave Landing System from dual sources, and to proceed quickly to demonstrate again the benefits of MLS in Category 2 and 3 operations and precision approach and departure sector guidance for airport capacity enhancement.

Recommendation

In summary we believe that for FY-90, a minimum total of $37.6 is needed for FAA's airport capacity technology work. If Operations funding of operations analysis work can not be assured from other portions of the FAA's FY-90, a total R,E&D amount of $42.6 will be needed. This is a substantial amount, but a tiny one when compared to the $3-4 billion cost of delay resulting from inadequate capacity. This $42.6 million need represents only $17.6 million in new money over the FAA budget request.

ITFCPMTGJR3
3/24/89

INDUSTRY TASK FORCE ON AIRPORT CAPACITY IMPROVEMENT AND DELAY REDUCTION

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ATTACHMENT 1

October 6, 1988

FY-1989 Congressional Language
On Airport Capacity Appropriation

Senate/House Conference Report

'AIRPORT AND AIRWAY TRUST FUND'

Airport Capacity Research.—The conferees have provided $25,779,000 for airport capacity research. The House and Senate reports cite a number of research activities and demonstration projects that the conferees expect will receive priority attention. These activities were identified by an industry task force as having the most immediate, direct, and beneficial capability for increasing capacity at congested airports. The conferees expect the FAA to ensure that its recent reorganization does not disrupt progress on these airport research activities. In this regard, the conferees direct the FAA to address the effects of its reorganization in the report on airport capacity research to be submitted to the House and Senate Appropriations Committees by December 31, 1988.

Senate Report Language

AIRPORT CAPACITY RESEARCH

The Committee concurs with the House in including $25,779,000 for airport capacity research. This is an increase of $5,000,000 over the request. It is clear that airport capacity limitations are emerging as a more and more serious constraint on the national aviation system. And no one doubts that there are implications for the margin of safety as terminal congestion rises.

This additional funding is intended for research on possible capacity improvements identified by industry representatives. Specifically, it is expected that this additional funding will be used to expedite the development, demonstration, and implementation of such concepts as: reducing minimum separation standards for parallel and converging approaches; establishing special capacity task forces at the busiest airports; applications of computer modeling techniques to capacity projects; terminal area automation including automated planning, coordination, and traffic control aids; airspace procedures for triple and quadruple IFR approaches, including simulation and field tests; simulation and field demonstration of new airport pavement, lighting and marking designs to improve runway usage; and wake vortex surveillance and forecasting to enhance airport acceptance rates.

The Committee concurs with the House in the directive that the airport capacity category should include only those research and development projects whose objectives and anticipated benefits are preponderantly in the area of capacity enhancement. The Committee also joins the House in requiring a report, to be submitted by the end of this calendar year, on FAA's plan for carrying out these projects, including completion dates and estimated funding requirements for implementation.

October 6, 1988

House Report Language

Airport Capacity Research.—The Committee recommends an increase of $5,000,000 over the budget request for airport capacity research. As stated last year, the Committee believes that insufficient attention and funding have been given to airport research and development needs for capacity improvements. A lack of airport capacity has already become one of the primary causes of aviation congestion and delay and threatens to become an increasing safety hazard and constraint on the national air transportation system. According to FAA estimates, 20 airports were seriously congested in 1986 and 40 additional airports will become seriously congested by the year 2000 unless their capacities are increased.

An industry task force on airport capacity improvements and delay reduction, established by the FAA in 1982, has identified a number of technological concepts which, if implemented, could provide short and long-term capacity increases at the most congested airports. The recommended airport capacity funding is to pursue and accelerate high priority capacity projects, such as reducing required IFR spacing between parallel runways to 3,000 feet, reducing minimums for IFR operations to converging runways to near VFR minimums, establishing procedures for IFR operations to triple parallel runways, continuing airport/airspace planning model development, improving airport pavements, and continuing wake vortex research.

The Committee expects that future FAA budget requests will identify and justify research and development projects that are directly related to airport capacity under this heading. Other efforts that may have a peripheral impact on airport capacity enhancement should be requested separately. The Committee further directs the FAA to submit by December 31, 1988, a plan for carrying out the airport capacity projects. This plan should specify the proposed dates and funding required for operational implementation of each project.

Rotorcraft.—The bill includes the budget request of $2,446,000 to assist in the integration of rotorcraft into the national airspace system. The Committee is aware of the potential to relieve airport and airway congestion through the introduction of tilt rotor aircraft technology into the nation's civil aviation system. The Committee is also aware of the deliberations of the FAA, NASA and DOD to recommend a national civil tilt rotor program to the Congress by September 3, 1988. The Committee wishes to emphasize its support of this effort and directs the FAA to allocate $200,000 to begin preliminary consideration of such a national effort in anticipation of a formal program approval.

ATTACHMENT 2

U.S. Department of Transportation
Federal Aviation Administration

Office of the Administrator

800 Independence Ave. S.W.
Washington, D.C. 20591

APR 21 1988

Mr. J. Donald Reilly
Chairman, Industry Task Force on Airport
Capacity Improvement and Delay Reduction
1220 19th Street, NW.
Washington, DC 20036

Dear Don:

I apologize for not responding more rapidly to your letter of March 1 concerning airport capacity program project objectives. The importance I place in this area required that the response be widely coordinated and that process had to compete with preparing for the 1989 congressional appropriations hearings.

Enclosed are the Federal Aviation Administration's (FAA) estimates of the total funding and time required for first operational implementation, as well as a funding breakdown for each of twelve objectives. My staff has taken the liberty of relating the objectives to planned projects appearing in the FAA's Airport Capacity Enhancement Plan and/or the Research, Engineering and Development Plan.

Sincerely,

T. Allan McArtor
Administrator

Enclosures

RESPONSE TO ITF QUESTIONS, MARCH 1, 1988

ITF ITEM / QUESTIONS/NOTES	Parallels 1	Converging 2	Triples 3	Staggers 4b	Terminal Automation 4a/c/d & 8b
TOTAL FUNDS 1st Implementation	$25M	$25M	$0.5M	$5M	$80M
TIME REQUIRED to 1st Implementation	5 Years	5 Years	1 Year	2 Years	8 Years
R&D/F&E/OTHER	15%/80%/5%	10%/85%/5%	90%/0/10%	80%/20%/?	90%/10%/?
NOTES	12 Airports ($80M) New radars & displays, comm. equip., procedures	Independent ops @ 30 airports ($170M)	1 airport simulation procedures development	Boston Logan as test/ops site	
RELATED ON-GOING PROJECTS Airport Capacity Enhancement Plan and/or RE&D Plan	-Indep. Parallel IFR Approaches -Parallel/Converging Runway Monitor (PCRM)	-IFR Approaches to Converging Runways -Flight Deck Displays	-Triple IFR Approaches	-Dep IFR Approaches to Converging Runways -Dep. Parallel IFR Approaches -Terminal Air Traffic Control Automation (TATCA)	-Wake Vortex Avoidance Forecasting -Advanced Traffic Management System -Terminal ATC Automation -IFR Approaches with 2.5-nm in-trail separation -Terminal Radar Enhancement -Terminal Air Traffic Control Automation (TATCA)

RESPONSE TO ITF QUESTIONS, MARCH 1, 1988

ITF ITEM / QUESTIONS/NOTES	Flight Deck 5	Models 6	Data 7	Aircraft Classification 8a	EVAS 8c	MLS Procedures 9 a,c
TOTAL FUNDS 1st Implementation	$3M	$20M	$1M/Yr	$2M	$4M	$4M/year
TIME REQUIRED to 1st Implementation	5 years	5 Years	1 Year	3 Years	3 Years	4 Years
R&D/F&E/OTHER	95%/5%/?	5%/10%/85%	5%/10%/85%	100%/0/?	90%/10%/?	100%/?/?
NOTES	Joint Program NASA	SIMMOD: Ongoing, 1st operational use was in FY-86, $2M/Yr	Data Collection using new sensor at Memphis/ Raleigh-Durham	Classify New A/C	Enhanced VAS at ORD, Mode S Air-to-Ground link (TCAS)	MLS Demonstration Plan Update
RELATED ON-GOING PROJECTS Airport Capacity Enhancement Plan and/or RE&D Plan	Flight Deck Displays of Terminal Area ATC Situational Information -MLS -ILS/DME	-Airport Capacity and Delay Models -NASPAC	-Independent Parallels -Parallel/Converging Runway Monitor (PCRM)	-Wake Vortex	-Wake Vortex -TCAS -Mode S Data Link	-MLS

RESPONSE TO ITF QUESTIONS, MARCH 1, 1988

QUESTIONS/NOTES \ ITF ITEM	MLS CAT 2/3 9b	Task Forces 10	Surface Traffic 11a	Surface Traffic 11b	Airport Design 12	Runway 13
TOTAL FUNDS 1st Implementation	$30M	$1M/Yr	$4M	$25M	1.5M/Yr	$11.0M
TIME REQUIRED to 1st Implementation	6 years	10 years	5 years	6 years		6 Years
R&D/F&E/OTHER	0/10%/?	1%/1%/98%	a: 100%/?/?	90%/10%/?	100%/?/?	90%/10%/?
NOTES	Initial limited production run of 20 units ($60M)	5 airports per year	Lighting and Marking		Ongoing Activity	Friction Ongoing Activity
RELATED ON-GOING PROJECTS Airport Capacity Enhancement Plan and/or RE&D Plan	MLS	-Airport Capacity Enhancement Task Forces	-Enhanced All-Weather Ground Operations Capability -Airport Surface Detection Equipment (ASDE-3)	-Airport Surface Traffic Automation (ASTA)	-Airport Pavement Model	-Runway Friction Monitor -Runway Occupanc Time (RO Advisory System

April 27, 1988

New Data on Airport Capacity Funding Needs and Funding Plans

The Industry Task Force on Airport Capacity Enhancement and Delay Reduction on March 1, 1988 (Attachment 6) asked FAA Administrator McArtor to provide an estimate of the total funding and time required to bring the specific Industry Task Force airport capacity project recommendations to first operational implementation.

The Administrator responded by letter on April 21, 1988 (Attachment 7)

In summary, the response, based on an AOCI staff analysis, says the following:

The total funding required to bring the projects to first operational implementation	$276.5 million
The time required ranges from 1 to 8 years for specific projects, with two projects continuing The average time for all projects	5 years
If the funding required is spread evenly over the years estimated for each project, total required per year is	$49.2 million
If the funding required is spread over the five year average time, the funding required per year	$55.3 million
If the projects could be speeded up (and some seem excessively long) to an average 3 years, the funding required per year would be	$92.2 million

The FAA response breaks down the estimates into the funding required for R&D, F&E, and Other Costs. The following is that breakdown, divided into two elements, R&D and Other:

Funding requirement to bring the projects to first operational implementation	R&D $159.8m	Other $116.9m
Funding requirement per year using the estimated times	R&D $27.1m	Other $22.1m

Funding requirement per year using a five year average time — R&D $31.9m Other $23.4m

Funding requirement per year if an expedited three year average time were used — R&D $53.3m Other $39m

The FAA response notes the F&E costs estimated for 12 independent parallel runway systems at $80 million, for 30 converging runway systems at $170 million, and for 20 Cat. 2-3 MLS systems at $60 million, for a total additional F&E cost of $310 million for only these three efforts.

The FAA Administrator has stated that R&D funds dedicated to airport capacity efforts for FY-'88 are about $26 million, and for FY-'89 are planned for $40 million. However these amounts include a series of efforts, many of them important and valuable, which however do not provide additional intrinsic airport capacity as the Industry Task Force has defined it.

Such useful, related efforts include Airport Safety Support systems, Vertical separation reduction efforts above FL-290, NASPAC, Terminal/Landside Modelling, Advanced Traffic Management System, Heliport Design and Planning, Low-Altitude Surveillance, among others. Some of these add capacity or valuable reliability in some circumstances, but are peripheral to the Task Force recommendations.

A generous estimate of the funds actually planned by FAA for the projects identified by the Industry Task Force is as follows:

For FY-'88 $16.7 million R&D, essentially no F&E
For FY-'89 $26.4 million R&D, essentially no F&E

Several of the Industry Task Force recommendations are funded way below the amounts FAA management thinks are needed (Example: Terminal Automation at about one quarter the need for FY-'88, at about half the need for FY-'89; no funding seems to be assigned to studies of use of cockpit display applications)

Bottom Line:

1. The FAA Administator has given us highly valuable estimates of what it will take to bring the Industry Task Force recommendations to first operational implementation

2. While the Industry Task Force and many others have for some years concentrated on the needed R&D funding (and the Congress has authorized $25 million/year for R&D), the Administrator has now made clear that what counts in the end, - achieving first operational use of the

concepts proven safe and successful, - requires both R&D and other funding (F&E and other).

3. He advises that to bring the recommended projects to fruition will require $49.2 million/year for several years.

4. Several of the most important projects are projected to take up to eight years, probably because the priority is not high enough and the FAA expert staffing is inadequate. (The Industry Task Force has recommended that FAA establish an independent, outside center-of-expertise)

5. If a 5-year average completion cycle were assumed, $55.3 million per year would be needed. To expedite to three years would require $92.2 million per year.

6. To implement three of these concepts at a relatively small number of locations, will require at least $310 million F&E.

7. By contrast, FAA plans to spend approx. $16.7 million total for FY-'88, and plans to spend $26.4 million in FY-89, with no corresponding F&E identified.

ATTACHMENT 3

AIRPORT OPERATORS COUNCIL INTERNATIONAL

December 1, 1988

Priority Projects for Airport-Related Research and Development

Airport operators, through the AOCI Technical Committee's Airport-Related R&D Subcommittee, have been briefed on FAA's current R&D activities and plans. FAA, over the past several years has had available to it an average of $1.5 million per year for all activities related to non-ATC related airport work, including lighting, airport design, security, pavement, etc.

Because of the limited funding available compared to the cost of some of the major efforts which seem to deserve attention, FAA has had to give seemingly important efforts only a lick and a promise. Further because FAA is inundated with prospective projects from many sources, both internal and external, but has only a tiny and fragmented group devoted to the subject and little sympathy from FAA management, there is a feeling that all too often projects are underfunded and seem to produce few tangible, measurable, or directly usable results.

FAA must consider and act on at least three kinds of work:

Work needed by its own internal organization (primarily Airports and Flight Standards) in support of safety standards and regulation development.

Work FAA is asked to do by outside firms and sometimes Congressional people which falls into the category of "Good Housekeeping seal-of-approval" testing.

Work to respond to problems identified by internal or external sources which may be the result of problems encountered in the field, such as projects which promise to reduce pavement installation, maintenance and repair costs, or which may permit better return for the large annual investment for airport aid which goes to airport pavement.

Airport operators can't readily comment on the first category. With respect to the second, it may be necessary for FAA to do some of this work, but it should be subordinate in priority and funding to the far more critical third category.

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With respect to the third category, airport operators believe that FAA should identify a limited number of priority projects and concentrate on those. It does not seem productive to start many different activities for which there is neither enough money nor enough personnel for FAA to direct the work wisely (even if the organization were not fragmented).

Of the projects to be selected for concentration, a number are likely to be expensive and of significant time duration. It is recommended that FAA develop a program plan which clearly identifies

the problems to be solved,

the approaches to be taken,

the non-technical hurdles to be expected,

the specific results expected and on what schedule,

the specific milestones to be achieved,

and the costs expected over the life of the project for each project .

The plan should also identify related work underway by others on the same subject and should solicit and utilize support from other organizations.

Airport operators have examined FAA's current and proposed activities, and their own perception of problems encountered in the field, and believe the following activities deserve particular attention:

1. Development and Agreement on a Universal Pavement Design in Conjunction with ICAO and other States.

Development, field validation and standardization of methodology for design, evaluation and testing of airport pavements in both moderate and extreme climatic conditions with consideration for aircraft traffic volume and mix.

Standard thickness criteria for new pavements, rigid and flexible

Unified design approach to slab layout

Unified design approach to load transfer mechanisms at transverse and longitudinal joints

Standard overlay thickness characteristics for defined load

and serviceability criteria, for various base pavement designs and conditions

Consistent and validated design calculations and methods for asphaltic overlays on rigid pavement; layered elastic analysis methods, valid accounting methods in designs for various base layer constructions

Develop synthetic materials suitable for use as aeronautical pavement in order to reduce costs through improved performance, over an extended life, with minimized maintenance.

Develop standards for vertiport pavement design to accommodate increased heat/blast from vectored-thrust VTOL aircraft.

Standard methodology for assessing impact of large and heavy-footprint aircraft on existing pavements, and on new pavements - a long-term item

and, perhaps less urgently:

Standard deviation allowances in the use of locally available materials, coatings, additives and special processes -- lime-cement-flyash, roller-compacted concrete, polymers, etc.

Standards for acceptable materials for cold weather protection and for overrun areas.

Standard acceptance criteria for inspection of materials and design/construction.

It will be necessary to develop a realistic coordinated effort involving FAA, NASA, DOD and airports on this project, and to assure recognition that extended monitoring and life testing will be required of typical designs. Retroactive examination of existing pavements to establish the relationship between design/construction and useful life will be needed. It will further be necessary, in order for large-scale field testing to be useful, to grant waivers from normal practice.

2. <u>A Universal Non-Destructive Testing Methodology</u>

Development, validation and standardization of a non-destructive test method to assist in rating pavement bearing capacity for aircraft, and prediction of pavement life.

Develop a data collection system to non-destructively monitor

pavement strength/lifecycle without disrupting airport operations.

3. Runway Friction Measurement Criteria and Relation to Aircraft Stopping Distance

The long-standing need for a validated method for establishing required operational stopping distance for different aircraft types and models/series, and wheel/tire characteristics, over the range of acceptable piloting techniques, vs. runway friction characteristics including consideration of pavement age, temperature and possible contaminants (rain, ice, snow), remains a valid objective and should be actively pursued.

Definitive work should continue to develop criteria and standards for acceptable friction measuring devices, with the aim of achieving uniform world-wide agreement on measuring scales and their meaning.

4. Runway Rubber Removal and Friction Retention Methods

FAA should direct or undertake intensive, high-priority research into runway rubber removal methods. Of particular importance are the following elements:

The efficacy of various rubber removal methods for removing rubber (such as water at various intensities, chemicals, etc.)

The quantitative effect of the various rubber removal methods on different types of pavement.

The impact of the various removal methods on in-runway lights/devices, and in runway markings.

Impact of climate or other regional conditions on rubber accumulation and removal, as well as pavement treatments or designs which avoid or retard rubber build-up.

Propensity of different rubber removal methods to polish the pavement or, conversely to improve friction characteristics.

Impact of different cleaning methods on runway grooves and groove performance.

Establishment of environmental impact, if any, of various rubber removal methods, and the development of techniques for eliminating adverse effects.

Development of methods to speed up rubber removal.

Develop specifications and standards of effectiveness for de-ice, anti-ice, and snow control chemical agents.

Establish criteria to permit use of aircraft arrestor devices in lieu of runway overruns.

Convincing, statistically significant data on these conditions should be used to develop criteria for future modification of FAR Part 139.

5. Continued Directed R&D and Validation Testing for Improved Joint and Fixture Sealants and Other Pavement Maintenance Techniques

6. Work to Increase World-wide Standardization of Airport Airside Signage, Marking and Lighting with Special Emphasis on Incursion Prevention

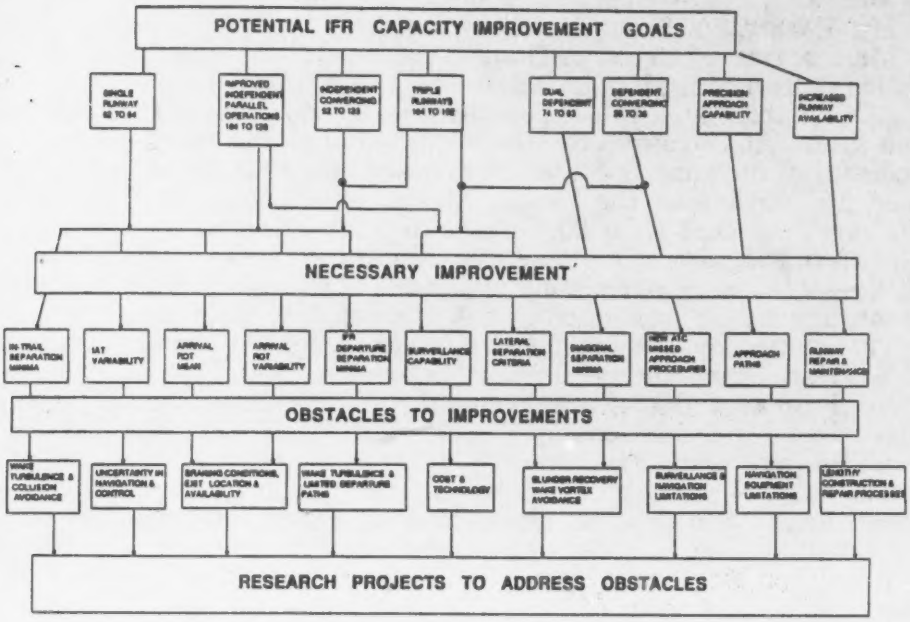
7. Development of Standards and Criteria for Runway/Taxiway Surface Roughness

   Standards are needed for surface roughness which take into account the dynamic behavior of the most critical aircraft expected to use the runway.

   Maximum acceptable g-value design criteria need to be agreed for

   - new or renovated runway designs
   - maintenance planning
   - operationally safe roughness limits requiring immediate action

ATTACHMENT 4


POTENTIAL IFR CAPACITY IMPROVEMENT GOALS
SINGLE RUNWAY 62 TO 64
IMPROVED INDEPENDENT PARALLEL OPERATIONS 104 TO 128
INDEPENDENT CONVERGING 52 TO 133
TRIPLE RUNWAYS 104 TO 102
DUAL DEPENDENT 74 TO 83
DEPENDENT CONVERGING 35 TO 36
PRECISION APPROACH CAPABILITY
INCREASED RUNWAY AVAILABILITY
NECESSARY IMPROVEMENT
IN-TRAIL SEPARATION MINIMA
IAT VARIABILITY
ARRIVAL FDT MEAN
ARRIVAL FDT VARIABILITY
IFR DEPARTURE SEPARATION MINIMA
SURVEILLANCE CAPABILITY
LATERAL SEPARATION CRITERIA
DIAGONAL SEPARATION MINIMA
NEW ATC MISSED APPROACH PROCEDURES
APPROACH PATHS
RUNWAY REPAIR & MAINTENANCE
OBSTACLES TO IMPROVEMENTS
WAKE TURBULENCE & COLLISION AVOIDANCE
UNCERTAINTY IN NAVIGATION & CONTROL
BRAKING CONDITIONS, EXIT LOCATION & AVAILABILITY
WAKE TURBULENCE & LIMITED DEPARTURE PATHS
COST & TECHNOLOGY
BLUNDER RECOVERY WAKE VORTEX AVOIDANCE
SURVEILLANCE & NAVIGATION LIMITATIONS
NAVIGATION EQUIPMENT LIMITATIONS
LOGISTIX CONSTRUCTION & REPAIR PROCESSES
RESEARCH PROJECTS TO ADDRESS OBSTACLES

Goal-Oriented RE&D Planning

MITRE CORP.
1983

Mr. VALENTINE. Mr. Poritzky?
Mr. PORITZKY. Thank you, sir.
The AOCI appreciates the opportunity to be here.
Mr. VALENTINE. Turn the microphone on.
Mr. PORTIZKY. I'm sorry. Thank you.
Good afternoon, Mr. Chairman, Mr. Lewis, Mr. Greene.

AOCI appreciates the opportunity to be here this afternoon. As you know, AOCI represents the local, regional and State governing bodies that own and operate the principal airports served by scheduled air carriers in the United States and throughout the world. We enplane more than 90 percent of total domestic and virtually all international traffic passenger and cargo in the United States.

We—with your permission, we will enter our complete statement, and let me just touch on the focus of that statement.

The testimony focuses on the critical capacity problem facing U.S. aviation and the need for a National Airport System Development Plan and DOT/FAA leadership in the execution of such a plan. There is a relationship between R&D and such a plan, as I'll mention in a moment.

The need for airport capacity capital improvement; a key element, again; and new financing tools to enable airports to undertake capacity and security enhancement projects.

It focuses on airport capacity R&D and the funding needs for them; on airport security R&D and the funding for them.

It touches on the importance on moving forward rapidly on the implementation of the Microwave Landing System; on FAA's air traffic control automation efforts, which we think have lagged greatly.

And, finally, it focuses on the need for this committee, for all of us, to help FAA augment its in-house technical expertise.

Lack of airport capacity is the major constraint in the aviation system today. The remedies are obvious, and there are only a few: to build new airports, build new air—build new runways, and to implement the technological improvements to make existing airports as efficient as possible.

Mr. Chairman, in your opening remarks you mentioned the display of the air—Aircraft Situation Display that will be available tomorrow. That work and the parallel effort and analytical effort in FAA, called NASPAC, gives the most—most graphic demonstration I know of what happens when an airport gets congested or closed. The effects ripple all over the country, particularly if it's a major airport.

We believe, therefore, that the Nation needs a strategic plan for the development of a National System of Airports, much like the National Interstate Highway Plan in the 1950s. Such a plan is critical if we are to begin addressing seriously the needs of our air transportation system.

We urge this committee to take the initiative in directing DOT and FAA to develop such a plan and implement it.

While, as I noted, a comprehensive plan is the most important step, we'll also need financing tools to enable airports, DOT and FAA, to fund and implement these projects.

Talking now to airport security initiatives. We've testified in recent weeks on the current concerns over aviation security and

the need for a major Federal research and development effort and funding for it.

The need for Federal funds here is underscored by FAA's recent rulemaking which requires 270 of our U.S. airports to institute rapidly a massive program to augment and automate the access systems. That's a laudable goal, we think. But without Federal R&D and funding for a pilot program, it cannot be sensibly achieved.

AOCI recommends a $12 million, 5-airport pilot program which would identify, and install, and test in an operational environment the systems and technology which could enhance airport security in accord with the new requirements.

Now, although access control systems can be an effective tool, we believe explosive detection devices deserve at least equal priority considering the nature of the threats.

The total FAA budget for fiscal year '90, as we understand it, for all aviation-related security R&D is $9.1 million. Inadequate, even to complete several needed security projects already under way, ignoring the door access R&D.

As discussed in our statement, and we've been quite specific about them, these projects require an additional $10.3 million in fiscal year '90. And that says to us that an FY-90 total of $22 million in new funds, beyond the requested $9.1 million, is needed for security R&D.

Don Reilly has spoken about the needs for airport capacity technology. And on behalf of AOCI, I thank this committee for its support of the airport capacity technology initiatives in the current authorization.

We strongly support and endorse the recommendations of the Task Force, which again, as you know, asks for more money. We believe, as does the Task Force, that for fiscal year '90 a minimum of 37.6 million is needed over the far smaller amount FAA claims will go for airport capacity work and the yet smaller amount which really has something to do with airport capacity.

If operations funding of operations analysis work is not possible, then the need, we think, is for about $42.6 million.

I want to touch quickly on the benefits of the Microwave Landing System. The U.S. Government has spent millions of dollars—hundreds of millions of dollars, now about 300 and some—and an unprecedented amount of effort by hundreds of dedicated people all around the world on the Microwave Landing System development and the program.

Without energetic action by the administration and enlightened support from Congress now, without rational thinking by the industry, which needs to focus beyond next week's bottom line, the program is likely to fail.

The only solution, one which has proven right each time in earlier programs, is for the government to move boldly to implementation.

The new FAA Administrator should firmly and publicly state his commitment to MLS and Congress should now support the second buy MLS funding.

AOCI—turning now to automation—joins the Industry Task Force in strong support of more rapid development efforts to automate the air traffic control system.

But something more is required for the en route system and the all-important connection between the en route and terminal systems.

FAA has been at work since 1974, I believe, on something called AERA, the Advanced En Route Air—the Automatic En Route Air Traffic Control System. That program has been almost on a teeter-totter of funding and management interest, gone up and down about that way. It has taken a back seat to flow control, which is the operative word that we hear a great deal about, and which is absolutely critical, and it's a program on which FAA has done a very fine job.

But the automation effort, the AERA effort, has to be pursued as do the other efforts that—that Don Reilly touched on.

We believe that in your action last year, Mr.—Mr. Chairman, in Public Law 100-591, you directed FAA to, and I quote now, "undertake and supervise a research program to develop dynamic simulation models of the ATC system and airport design and operating procedures."

And, this is what I'm—what I'm coming to, "for testing proposed revisions and airport and air traffic control operations programs."

Now we believe that the development of a realistic, prototype FAA facility, in which every mature project to automate elements of the ATC system, can be wrung out, must be wrung out, in a realistic environment. And we believe such work would be a logical implementation of the directive Congress gave to FAA last year.

We urge this committee to instruct FAA that construction of such an automation demonstration and validation facility is needed to achieve meaningful and acceptable air traffic control automation on a timely basis. And that such a facility is considered, as we believe, Mr. Chairman, a valid and timely response to Public Law 100-591.

Now, coming to the end of this quick summary, I need to talk a bit about the need for a strong, skilled, technologically up-to-date FAA.

FAA has suffered for a number of years with the problem of a growing challenge but a declining, aging work force which, for all practical purposes, could not be augmented with new blood.

Now, contractors can do many things for FAA but they cannot substitute, in our view, for a critical mass of fully competent, up-to-date FAA insiders to manage and direct the crucial aviation work it must do.

There is a serious problem here and we believe the committee needs to be aware of this problem and to assure that a critical mass of skilled FAA insiders will be put to work on these crucial efforts.

In closing, let me say that both Don Reilly and I have talked about the need for more money. I believe—the Airport Operators believe—that in the R&D arena, since the NAS Plan was begun, real research and development has taken a back seat. I think we're suffering for that.

I'm delighted to have the opportunity to say it here: There does need to be more money spent on research and development and aviation, both near term and long term. We need to be sure we

have the necessary skills available within FAA. We've been short-changing it. I think we can do so no longer.

Thank you, Mr. Chairman. We'll be happy to answer questions.

[The prepared statement of Mr. Poritzky follows:]

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AIRPORT OPERATORS COUNCIL INTERNATIONAL

STATEMENT OF

Siegbert B. Poritzky
Vice President, Technical and International Affairs

for the

AIRPORT OPERATORS COUNCIL INTERNATIONAL

on

FAA RESEARCH & DEVELOPMENT PROGRAMS

Before the

Subcommittee on Transportation, Aviation and Materials
Committee on Science, Space and Technology
U.S. House of Representatives

April 11, 1989

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* AOCI member airports enplane more than 90 percent of total domestic and virtually all international scheduled airline passenger and cargo traffic in the U.S.

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Statement of the Airport Operators Council International before the Transportation, Aviation and Materials Subcommittee of the House Science, Space & Technology Committee on FAA's Research & Development Programs, April 11, 1989

Mr. Chairman and Members of the Subcommittee:

I am Siegbert B. Poritzky, Vice President of Technical and International Affairs for the Airport Operators Council International. AOCI represents the local, state and regional governing bodies that own and operate the principal commercial service airports in the United States and throughout the world. AOCI's U.S. member airports enplane more than 90 percent of total domestic and virtually all international scheduled airline passenger and cargo traffic in the U.S.

We appreciate this opportunity to express our view and concerns regarding FAA Research and Development programs and the state of the airport and airways system. Our testimony will focus on the following areas and concerns which need this Subcommittee's attention and support:

1. The critical airport capacity problem facing U.S. aviation today and the need for a strategic National Airports System Development Plan and DOT/FAA leadership;

2. The need for greater FAA funding of airport capacity capital improvements, and new financing tools to enable airports to undertake capacity and security enhancement projects;

3. Airport capacity technology initiatives and funding needs;

4. Airport security R&D initiatives and funding needs;

5. The importance of moving forward on MLS development;

6. FAA ATC automation efforts; and,

7. The need to help FAA augment its in-house technical expertise.

AIRPORT CAPACITY PROBLEMS AND NEEDS

Although we are here today primarily to focus on FAA R&D efforts, we are compelled to bring to your attention the critical capacity problems plaguing the aviation system. The state of aviation today is not good, and the prospects for the future are troubling. For many years, we have failed to build adequate airport facilities to keep pace with air traffic and passenger demand, which has grown dramatically since deregulation. It has become painfully obvious to us in the industry and to air travelers and shippers that we do not have enough airport capacity throughout the system and at key locations to efficiently handle aircraft and passengers.

The lack of capacity is the major constraint on our nation's aviation system today. It has prevented the aviation system and industry from growing and flourishing, and has shortchanged our nation in terms of the economic benefits that are gained by airport facilities and activity. It has also compounded the effects of airline concentration at major hubs, where one or two carriers now dominate, and the resultant impacts on airline competition, air fares and service, by denying opportunities for competitive entry by new entrant carriers.

Consider these facts:

-- In 1987, over 450 million passengers and billions of dollars in cargo were handled at U.S. airports. By 1999, the FAA forecasts that passenger enplanements will increase by 72 percent and aircraft operations will grow by 33 percent.

-- In 1987, 21 major airports were "seriously congested", according to the FAA, each experiencing more than 20,000 hours of delays. Barring major improvements in airport capacity, about 40 airports will become seriously congested by 1997, affecting 80 percent of all passengers.

This is an alarming prospect considering the ripple effect that congestion and delays at one major airport can cause throughout the system. Delays are costly: each 20,000 hours of delay equates to an additional $32 million cost to airlines; and today airlines and passengers are paying an estimated $5 billion each year for delays, according to the FAA, due to increased operating costs and lost time. As a nation, we are paying a high price for an inadequate, over congested air transportation system, and we are losing the full benefits of deregulation.

The remedies are obvious, and there are only a few:

1. Build new airports -- Austin and Denver are the only communities planning for new airports, and would be the first major airports to be built in fourteen years. At least three additional new major airports will also be needed.

2. Build new runways -- Among the top 100 airports, 50 new runways and about a dozen runway extensions are either planned or under construction at a cost of more than $2.5 billion.

3. Implement technological improvements that are available to make existing airports and runways as efficient as possible to optimize the limited existing capacity.

AOCI's 1986 forecast of airport capital development needs for the period 1988 to 1992 shows a requirement of nearly $30 billion. The FAA's own National Plan of Integrated Airport Systems (NPIAS) reveals similar needs of $24.3 billion over ten years for AIP-eligible projects alone, 72 percent of which are projects to increase airport capacity. Meanwhile, in the face of these dramatic needs, the Aviation Trust Fund surplus has accumulated a $6 billion uncommitted surplus.

NEED FOR A NATIONAL AIRPORTS SYSTEM DEVELOPMENT PLAN

While the NPIAS is a useful document to estimate airport needs, it does not provide a strategic plan of action for meeting those needs. We have a plan for the development and modernization of the airspace and air traffic control system -- the NAS Plan. Our nation now needs a strategic plan for the development of a national system of airports. The benefits and efficiencies the NAS Plan will provide will not be enough if we do not have adequate airport facilities and capacity on the ground. For that we need a national plan much like the National Interstate Highway Plan in the 1950's. The development of a national airports system is as important today as the interstate highway system was back then. Today we are only "filling potholes" in the existing, inadequate airport system, instead of building the new runways and new airports that are critically needed.

The elements of such a plan should include:

- an assessment of current capacity and inadequacies of the airport system in relation to current air traffic demands, both system-wide at strategic locations;

- a five- and ten- year projection of capital improvement needs, with special emphasis on projects needed to increase capacity at specific airports and throughout the national system;

- forecasts of future air traffic and passenger demand and corresponding airport capacity increases needed to accommodate growth;

- identification of technological improvements with timeframes and cost estimates for implementation to achieve additional capacity at existing airport facilities; and, most importantly;

- an action plan that identifies where new airports are needed, including new hubs and relievers, and where existing facilities should be expanded and new technologies applied to increase capacity for the benefit of the entire system.

In the Airport and Airway Safety and Capacity Expansion Act of 1987, Congress directed the DOT Secretary to conduct a two-year study to develop an overall airport system plan through the year 2010 that will assure the long-term availability of adequate airport system capacity. DOT was required to submit a preliminary report within one year and a final report by January 1, 1990. We are concerned that insufficient attention and resources will be given to this report. While this is an important step, and we urge the Congress to be vigilant about DOT/FAA's progress on the report, it must be accompanied by a comprehensive strategic action plan for FAA to undertake a leadership role in attacking the airport capacity problem.

We believe a National Airports System Development Plan is critical if we are to begin addressing serious the needs of our air transportation system. Airport communities have been largely stymied in their efforts to expand capacity and build new airports, because of local political and environmental obstacles and the difficulty of obtaining airline approval for such projects, but most importantly because of the lack of federal funding and commitment.

DOT and FAA leadership is needed to encourage and support development projects where they are needed and where communities have given their support. We urge you, Mr. Chairman, and this Committee to take the initiative and direct DOT and FAA to develop a National Airports System Plan -- **and implement it.**

INNOVATIVE AIRPORT FINANCING TOOLS

While a comprehensive capacity/needs inventory and action plan are the first important steps, we will also need new financing tools to enable airports, DOT and FAA to fund and implement these projects. The Airport Improvement Program (AIP) is clearly inadequate to meet these needs, as evidenced most dramatically by FAA's inability to provide AIP dollars requested for the new airports in Denver and Austin, and for many other important capacity projects. At present, the traditional airport funding sources--AIP grants and tax-exempt bonds--provide about $1 billion less annually than airports need to finance planned projects. The AIP program must be fully funded, and that will inevitably require reforming the budget and appropriations treatment of the Aviation Trust Fund programs, which we wholeheartedly support. But we recognize the federal budget

dilemma and, in response, AOCI has developed two new funding initiatives which could provide substantialLY greater funds for airports with minimal, if any, impact on the federal budget deficit. These initiatives have been endorsed by our member airports across the country, and we hope you will give them serious consideration.

... proposal is to create a Federal Airport Revolving Loan Fund to provide loans from the Trust Fund surplus for airport capacity, security, safety and noise projects. These loans would provide an additional $1 billion annually for airports to supplement AIP funding and provide a reliable source of funds for many important projects. The RLF would require an initial infusion of Trust Fund surplus monies to start-up the Fund, but would eventually become a self-sufficient source of funds on which airports could rely for years to come. Over 30 years, the RLF could generate funds to finance $68 billion in airport construction projects, all from only a few million dollars in initial seed capital from the Trust Fund. The Revolving Loan Fund concept offers a creative, budget-sensitive way to put the dormant Trust Fund surplus to work and provide a long-term, self-financing source of funds for airports.

In addition, we believe it is time to return to airport operators the right to raise revenues through local per passenger charges, which federal law presently prohibits. In this era of deregulation and growing demand for airport facilities and services, it is imperative that airports have adequate local financing capabilities to overcome current constraints in financing and expediting needed projects. This revenue source is particularly important in view of current threats to airport and aviation security and the need for better systems to counter the threat. Airport passenger charges would enable each airport to impose a fee to cover the costs of access control systems and other security enhancement programs, as well as to finance other important capacity projects.

We urge this Subcommittee to support these airport funding initiatives and provide the means for airports to carry out their responsibilities to develop the efficient and secure air transportation system our country needs.

AIRPORT SECURITY INITIATIVES AND RESEARCH & DEVELOPMENT NEEDS

We have testified in recent weeks before this and other committees regarding the current concerns over aviation security and the need for a major federal research & development effort and funding to develop new technology to enhance airport and aviation security programs.

The need for federal funds is underscored by the Federal Aviation Administration's recent rulemaking which requires 270 major U.S. airports to institute, on an accelerated schedule, a massive program to augment and automate their systems which control access to the airport operations area (AOA). It is a laudable goal, and one on which many airports have already begun work. But without federal research and development funding applied through a pilot program, it cannot be achieved in a sensible manner.

The reasons are many. First, the rulemaking specifically declined to define the term "secure area". Thus, 270 airports are not clear about what the government expects them to secure. The rule also assumes an average of 128 access points to be secured at Phase One airports. Chicago's O'Hare airport stopped counting at 1627; New York's JFK airport reached 1500 without adding cargo or general aviation facilities.

Further, there is no guidance from the FAA as to what type of

system will meet the requirement for enhanced security procedures. Indeed, the industry has begun to hear from an abundance of vendors of such diverse equipment as magnetic stripe card readers, proximity readers, bar code readers, alpha-numeric key pad locks, laser scanners and others, all of whom profess their systems to be the least expensive, most secure, most effective, most efficient, or most flexible. All of this leads to the conclusion that a pilot program is absolutely essential to develop these systems and gain the operational experience to identify and resolve problems before we spend vast sums of money to install them at 270 airports.

The access control rule is silent on the need for compatibility among the 270 systems. The need for compatibility becomes obvious when one considers the high degree of mobility in the aviation industry, where one flight crew might require access to more than a half-dozen different airports each day, or where fired employees can access their company security system at another airport within a matter of a few hours. But such compatibility requires a great deal of development and standardization effort.

Finally, the rule estimates a total cost for access control systems at all 270 airports to be just under $170 million over ten years. However, AOCI's and industry estimates reveal the actual costs may be ten times that amount, because the FAA has looked only at initial equipment costs, while ignoring such costs as retrofitting terminal facilities with compatible door frames, doors, hardware, new wiring and conduit, and CCTV monitor systems and wiring at remote perimeter sites. Other peripheral, but expensive problems to be solved include asbestos abatement requirements at older facilities, and compatibility with state and local fire and safety regulations which might require these newly-locked doors to be easily opened in case of emergency.

How, then, do we identify and implement a rational, workable nationwide airport security system?

First and foremost, the federal government, led by the FAA, must define the threat against which we are securing our airports. The early 1970's "hijack-to-Cuba" threat which was the initial impetus for passenger x-ray screening, and the disgruntled employee "internal threat", have been replaced by the threat from international terrorists seeking to make a political statement against a government...generally the United States. Nothing in the FAA's new rule would have in any way prevented the Pan Am 103 disaster, and it is our view that the PSA employee incident on which the rule was based was a once-in-60-year aberration which does not in itself justify a potential multi-billion dollar security system which in all likelihood would not have stopped the tragedy.

Following an identification of the true threats, the federal government should strengthen its program of research and development. We have suggested to the FAA and to several Congressional panels that a federal pilot security program at five airports of varying size, traffic levels, and configuration would help identify the equipment and methodologies which work...and equally important, those which do not work well, in a functioning airport environment. Further, it would allow airports to build their systems based on proven technology which concentrates on "real-world" data for airport security systems and technology.

In virtually every case, commercial airports are owned and operated by a state or local governmental entity, which has neither the budget to comply with the rule, nor the fiscal incentive to engage in what amounts to a federally mandated trial-and-error security R&D program. Therefore, for the control of threats which may be due to problems of access control, AOCI

recommends a $12 million, five-airport, 18-month pilot program which would identify, install and test in an operational environment the systems and technology which could enhance airport security in accord with the FAA-required process.

The FY'90 FAA budget for all aviation-related security R&D is $9.1 million. This is inadequate even to complete several needed security R&D projects already underway. AOCI has outlined below the additional amounts necessary to complete these projects under an expanded and accelerated program, along with an estimated time of completion of research, engineering and development for each.

The breakdown of the AOCI funding proposals are as follows:

- Thermal Neutron Activation (TNA) explosives detection:

  $2.6 million to develop a mobile system (26 months);
  $2.5 million to adapt the system to inspect carry-on bags (26 months);

- Vapor Detection systems:

  $4.2 million to develop a passenger walk-through system, (18 months);
  $4.0 million to develop a carry-on bag system (21 months);
  $2.5 million for a checked-baggage system, (22 months);
  $1.7 million for a portable system, (25 months).

In addition, there are new concepts being tested by FAA at the Technical Center in Atlantic City which should be explored more rapidly. They include:

$1.6 million for bio-technology research on micro-organisms which react to explosive vapors (31 months);
$3.3 million for development of gamma ray absorption explosive detection techniques (34 months);
$3.2 million for active millimeter wave inspection techniques for non-metallic substances, such as drugs, explosives and weapons (30 months);
$1.1 million for bottle-content inspection, to identify liquid explosives (22 months);
$0.7 million for development of x-ray enhancement software to correlate separate images of independently carried items (12 months).

Certain other proposals which deserve added attention and funding include:

$0.75 million for investigation of new x-ray techniques such as "low Z" imaging to identify specific chemical compounds by their atomic signature;
$1.25 million to develop knowledge-based expert computer systems to improve identification profiles of high-risk passengers, cargo and baggage;
$2.0 million for human factors research to improve the performance of screener personnel;
$1.50 million for improved developments in bomb-proof baggage lockers in non-sterile areas.

AOCI recognizes that a great deal of security research and development is being pursued by many government agencies, and the possibility for overlap exists. Therefore, we recommend the formation of an ad hoc interagency working group to identify those areas which overlap, and where such duplication is found, to recommend a lead agency to help achieve significant cost and time savings. The group would be made up of FAA, Customs, U.S.

Marshals Service, FBI, CIA, DEA, the armed forces, and certain foreign governments.

The federal government must accelerate R&D work in these areas to expedite the development of sensible and effective systems and technology for aviation security.

These projects require an additional $10.3 million for FY '90, [plus $22.6 million spread over FY 91-92]. A FY'90 total of $22.3 million in newly appropriated funds is needed for security R&D. This additional amount includes $12 million for a five-airport access control pilot program. We believe this need, as important as it is, should not be met by diminishing the amounts for the other FAA R,E&D we have identified. New funds are needed.

AIRPORT TECHNOLOGY INITIATIVES AND THEIR FUNDING

Technological improvements and improved airspace procedures are very important to adding capacity to the system. We believe that FAA's R&D efforts must be better focused and funded to expedite the development and application of innovative procedures for handling aircraft and increasing airport capacity.

Airport operators especially appreciate the recognition given by Congress to the serious and growing problem of limited airport capacity. In the 1987 reauthorization of FAA's R&D program, this Committee required that at minimum $25 million should be spent by FAA each year for airport capacity enhancement initiatives. This action has been instrumental in focusing FAA's energies and resources in this important area, and the appropriations committees have given their support by dedicating funding to these priority initiatives. However, progress has been slow and a more committed effort is needed to move these initiatives to fruition.

The Airport Operators Council International strongly supports and endorses the recommendations of the Industry Task Force on Airport Capacity Improvement and Delay Reduction, of which AOCI is an active organization member. We associate ourselves fully with the statement of the Industry Task Force.

In selecting the elements of needed effort the Industry Task Force chose to concentrate on tasks which show promise of yielding increases in the direct, intrinsic, maximum achievable capacity of an airport complex. (This selection casts no negative reflection on other necessary FAA R&D work, but identifies the tasks which are considered to have the highest payback in terms of direct, full-time airport/terminal area capacity).

The specific recommendations of the industry through the Industry Task Force have emphasized tools and procedures for the reduction in lateral or longitudinal spacing requirements, tools to permit the reduction in required wake vortex spacing, the ability to provide independent arrival or departure streams, and the ability through automation to reduce inter-arrival variability. These projects will provide direct capacity increases essentially full time, right at the cutting edge where the requirements are.

The funding requirements candidly laid out by FAA Administrator McArtor in 1988 (a minimum of $55 million/year total funding for at least five years to accomplish the projects identified by the Industry Task Force) remain the best indication of the real need. It is time to recognize that we are embarked on a major effort which requires adequate funding.

Airport Capacity Technology Needs for FY 1990

AOCI joins the Industry Task Force in recommending the following specific capacity enhancement initiatives and associated funding levels for Fiscal Year 1990:

Completion of Development, Installation, Demonstration, Procedure Development and Validation of High Data Rate and Medium Data Rate Sensor Systems for Closely Spaced Parallel and Converging Runway Reduced Minimums Operations	$8.0 million
Airspace Procedure Development, Simulation, Validation and Demonstrations for Triple/Quadruple Runway Simultaneous Operations, Reduced Minimums Converging Operations, Wet-Runway Reduced Minimums Operations, Establishment of Criteria and Specific Achievable Minimums Benefits from MLS Precision Curved/Segmented Approaches and Departures	$4.0 million
Development and Validation of Terminal Automation Tools for earliest possible stage by stage implementation of a terminal operations planner, by 1992	$8.0 million
Reduction of the Capacity Reducing Impact of Wake Vortices, through development of automatic dynamic spacing adaptation, development and validation of wake vortex detection and avoidance sensors and renewed efforts at elimination of wake vortices at the aircraft source.	$4.0 million
Simulation Model Development and Validation	$2.0 million
Development and Validation of Minimum Performance Standards and Procedures for safe use of cockpit traffic displays in terminal operations	$0.4 million
Airport Surface Visual Control (Lighting) to permit efficient taxiway exit operations, development, validation and procedure development for stop bars and hold-short systems for runway entrances and ends	$1.2 million
Airport Surface Traffic Automation, utilizing earlier research and development to develop and demonstrate an airport surface surveillance, guidance and control system, implementable in steps and using the technologies used in the airspace system where practical	$4.0 million
Airport Capacity Enhancement Planning and Analysis	$1.5 million
	$33.1 million

This amount is the minimum need for a concerted attack on the capacity problem. Little if any of this is research; virtually all is development.

In addition, approximately **$5 million** of additional FAA Operations funding (or alternatively, R,E&D) is required to conduct planning and development analyses to assure optimal operation of the FAA system, by funding application of appropriate airport and system analytical tools, and supporting airport-specific task forces.

A minimum of approximately **$4 million** of additional R&D funding is necessary to conduct meaningful airport-related R&D, to enhance safety and to provide for product improvement on FAA's

major investment in runways and pavements. (A proposal for well-focussed priority FAA R&D in this field has been prepared by AOCI, Attachment 2).

Virtually all the recommendations contained in this material deal with ideas and concepts which are well understood and which require energetic development and implementation. We believe a small amount of money should be devoted to the development of new ideas and new concepts by advanced thinkers in the field, and propose that Congress earmark **$0.5 million** for this purpose.

F&E funds will be required to achieve the gains promised by the R&D projects. Most of such funds have not yet been requested, but the above needs assume that FAA's FY-90/91 request for $53.6 million for 10 precision runway monitors will be favorably considered by Congress.

In summary we believe that for FY-90, a minimum total of $37.6 is needed for airport capacity technology work. If Operations funding of operations analysis work can not be found, a total R,E&D amount of $42.6 will be needed.

THE NEED FOR THE BENEFITS OF THE MICROWAVE LANDING SYSTEM

The U.S. Government has spent hundreds of millions of dollars and an unprecedented amount of effort by hundreds of dedicated people all around the world on the Microwave Landing System program. Without energetic action by the Administration and enlightened support from Congress now; without rational thinking by the industry focussed on interests beyond next week's bottom line, the program is likely to fail.

The program, begun at the initiative of U.S. airlines, had the full support of the entire industry for a number of years. FAA, NASA, and DOD undertook the MLS development program on the basis of industry urging.

The process of obtaining international agreement and standardization was long and difficult. The U.S., committed to creating a system on which there was international agreement **before** implementation, put its prestige on the line in ICAO, and is being carefully watched to see if it will now fall off the wagon.

An argument heard frequently is that ILS has improved so drastically in the last few years that MLS is no longer needed. While ILS <u>has</u> improved, the argument does not hold water. ILS remains a "nervous", hard- and expensive-to-maintain, single approach path system with limited capability, a limited number of channels, high site-preparation cost, a sizeable "critical area" on the airport which must be sterilized and thus wastes valuable airport real estate, and no way to expand its utility to provide precision approach sector or departure/missed approach coverage or consistent coverage to runway threshold or beyond. ILS has no capability to provide angled, segmented or curved approach and departure paths which are of great value in reducing inter-airport interference, producing noise relief to communities around airports, and facilitating introduction of important capacity-enhancing operating procedures at capacity-constrained airports.

Another argument is that MLS represents a now-obsolete technology; yet another that satellite navigation will provide the same capabilities as MLS. Both arguments are without merit. The new technologies are likely to be highly valuable, but they will not substitute for MLS.

There is really no doubt as to MLS capability and value. MLS is perhaps the most thoroughly tested and wrung-out system

ever developed for U.S. and world-wide implementation. Its capabilities have been demonstrated time and again, and its value in providing better, safer approach and landing service, and sorely-needed airport capacity enhancements are clear to anyone who cares to look. It is also true that the user reluctance to move out has precedent in virtually every system improvement, going back as far as the VOR, which was roundly denounced as unnecessary and unreasonable by major parts of the aviation community years ago.

The only solution to this problem, one which has proven right each time, is for the Government to move boldly to implementation. As history has shown, the benefits will not be fully appreciated until a large ground system network exists, and users have had the opportunity, in real life, to gain the benefits and create new beneficial procedures. The new FAA Administrator should firmly and publicly state his commitment to MLS, and Congress should now support the second-buy MLS funding.

Unfortunately, the critics of FAA on MLS have a great deal to be critical about. Many mistakes have been made on MLS over the past several years. Yet it would be a mistake to let the program go down the drain. The problems and past mistakes are understood by the new FAA management, and there is every indication that there is a real effort under way to retrieve the situation. All of us need to help in any way we can. The members of the Airport Operators Council International remain strong supporters of the earliest possible implementation of MLS.

A strange mythology has grown up around the efforts to kill off MLS.

Myth 1: The march of technology has passed MLS by, it is now an obsolete concept with 1960's technology.

The design concept for MLS, painfully arrived at over about ten years from 1967 to 1977 with the best brains in the world's landing system community, using requirements arrived at with equal thoroughness by the world's operational community, was conceived with the clear understanding that it would have to last as long as ILS (give or take about 50 years) and that it would have to be able to adapt to new technologies in the systems mechanization which were only dreams at the beginning. I believe that the effort was successful. While before the standardization of MLS a new idea for the "best" landing system came around about every six months, there has been no serious challenge to the validity of the MLS concept. The changes in technology which have occurred will improve and simplify the manufacture of MLS, not obsolete it.

Myth 2: "Synthetic Vision" devices used with head-up displays will obviate the need for MLS.

"Synthetic Vision" systems are an age-old aviation dream of making all weather good weather, and night into day to help pilots be visual at all times. There now appears to be some hope that the dream will some day come true or perhaps almost true. But can anyone seriously imagine that we will abandon coupled approaches or autoland or even flight director approaches with precision guidance, for visual hand-flown landings every time? Of course not. Precision approach and landing guidance will continue to be required and like the rest of our technologies we need something better than the venerable 1930's ILS. We need it to get the most out of our airplane systems and our airports. It may well be that synthetic vision devices and HUD may allow an operator to remove one out of a dual or triple landing system and thus gain some economies, but I simply can't imagine operating a modern airplane -- airline or business G.A -- without high class flexible precision approach and landing guidance. And that means MLS.

Myth 3: Satellite navigation will be as good as MLS and will do what MLS can do, or good DME/DME area navigation will provide all the curved segmented approaches we may need.

Precision approach and landing guidance systems must provide lateral accuracy to a very few feet, and vertical accuracy to even fewer. The U.S. Global Positioning System (GPS) or the Global Navigation Satellite System (GNSS) postulated by the International Civil Aviation Organization (ICAO) can probably be counted on to 100 meters initially, and much better eventually, in the lateral plane, especially if there is a (not-for-free) differential adjustment at the airport. ICAO FANS projected that with luck GNSS might someday permit Category 1 operations, not more, -- and certainly not autoland quality information, because there are apparently some pretty basic limitations on what can be achieved with satellite systems in the vertical plane. (A lot of people are talking about the surveying quality accuracy of GPS, especially in the lateral plane, but remember surveyors can integrate their information for a long time -- minutes or hours -- while airplanes have a second or so). DME/DME simply isn't accurate enough to qualify for close-in precision operations, and of course has no vertical guidance component at all.

The next part of this argument goes that GPS/GNSS or DME/DME area navigation will serve for all but the final approach segment, and that ILS will do fine for that for a long time. The trouble here is that on the approach, it would require a shift of guidance signals from whatever to the precision approach aid very late in the approach. Airlines and especially autopilot/flight control system people have always hated this idea because there would be so little time to stabilize on and get confidence in the final approach guidance signal source. But even if that were not a problem, from an airport capacity vantage point, the highest payoff from precision guidance is likely to come from the ability of MLS to provide precision guidance for flexible departure and missed approach paths in multiple runway simultaneous stream operations or where nearby terrain or populated areas make problems. ILS does not have this capability, of course, and moderate accuracy (in this context) GPS/GNSS or DME/DME sources simply won't bring the benefits when high accuracy is required in tight situations.

But there is yet another argument, closer to the gut. All the way back in the time when a lot of very sensible people sat down in the Radio Technical Commission for Aeronautics' Special Committee 117 to develop the recommendations for what became MLS, literally dozens of system concepts were scrupulously examined, among them multilateration systems, of which GPS/GNSS is one. The group was reluctant to select systems of this kind for precision approach and landing guidance, because they felt that there was a comfort in having a system whose guidance beams were nearby and anchored to the ground when the aircraft was a few feet from very hard and unforgiving runway surfaces. Most of the participants didn't like the idea of reaching out 100 miles, never mind 22,000 miles to the artificial stars, to measure the ten feet from wheels to concrete. Not a scientific argument of course, but still a consideration.

Using navigation data this way, in which a great deal of quite complex software is required between signal reception and processing, and then application to a display or an autopilot, brings with it the issue of system validation and certification as a critical system. Not an easy task to face.

Even though problems remain to be solved, airport operators believes MLS must be brought to early implementation. If we kill off this system now we will be condemned to invent it again in a short time, with all the years and the sweat and the dollars and

international bickering that it will undoubtedly take. Hundreds of millions of dollars will have gone down the drain, a large credibility problem will result for the U.S. -- and we won't reap the benefits that are obvious to anyone who cares to look. Among the important benefits MLS offers are: the creation of least-noise approach and departure paths, shorter precision finals to solve airspace conflicts, reducing required decision heights because the MLS beams are clean to threshold and beyond, taking advantage of routinely lower flight technical error, using the precision guidance to permit better close-in operations with less airspace required for parallel runway and converging runway missed approach operations, and having enough channels for future needs.

AN INITIATIVE TO CARRY FAA'S ATC AUTOMATION EFFORTS TO REALITY

AOCI joins the Industry Task Force in strong support of more rapid development of efforts to automate the ATC system. The terminal automation efforts (TATCA) and the airport surface system work (ASTA) are important efforts and deserve strong support. But something more required for the enroute system and the all-important connection between the enroute and terminal systems.

FAA began serious work in 1974 on a project called AERA (for Automated En Route ATC) to develop methods and techniques to aid controllers by providing automation tools for the enroute and transition areas to do routine separation tasks automatically, and otherwise to introduce automation into the air traffic control process where this held promise. This work has had the dual purpose of increasing the capacity of the system by permitting controller teams to control more traffic and to establish far longer conflict-free clearances than could be managed without automation help, and to free controllers to use their considerable and indispensable skills to safely manage aircraft flows and resolve the difficult separation problems for which machines are not optimum.

A great deal has been learned and a large amount of effort and resources expended, but the day of actual first implementation has regularly slipped, from a beginning in 1992-93 postulated in the 1982 National Aviation System Plan to an unconvincing turn-of-the-century start in recent FAA statements. There are many reasons for the delay, but among them are hot and cold levels of FAA management commitment and enthusiasm for real ATC automation over the years, lack of funding priority, and lack of clear focus on the best ways to introduce automation with the requisite level of safety. The necessary funds and people resources needed to make progress have not been in evidence.

The strike of air traffic controllers in 1981 placed a great deal of focus on the FAA central flow control process, which was an essential tool in a truly heroic effort to keep our air transportation system functioning. The flow control system has been and remains a vital element of the traffic control system, and it has improved greatly over past years.

Central Flow Control has also, in recent times, become a kind of competitor, for funds and function, to the work which will lead to the real automation tools for air traffic control. It has been understood by most experts since the 'seventies that flow control and ATC automation must work hand-in-hand. In its best execution, ATC automation, like the AERA work, should be the major tool to provide automation aid to controllers in a way which permits dynamic response in real time to changes in local conditions and in traffic demand and mix. The flow control system should be concerned, not with individual aircraft, but with flows of aircraft, and should be used ideally to modulate the process. This combination would overcome many of the problems currently

being experienced with the flow control process because of its relative inflexibility and because it attempts to do from a single location in Washington tasks that should be dealt with by the control teams operating locally or regionally.

It has become clear to all who follow the progress of the air traffic control system that there is a physical limit to the amount of information (and therefore aircraft) and a limited number of dynamically varying control elements that a controller team can be expected to handle. As traffic grows and the demands for efficient handling of more and more aircraft grow, rapid development of automation tools that can really help controller teams has become a matter of the highest priority.

However, there is a body of opinion, including that of AOCI that meaningful levels of ATC automation will not be seriously considered for implementation without a believable prototype installation of this new technology that managers, controllers and money providers can see and touch and try and evaluate in a realistic environment, running in parallel to the live ATC operation but without impacting it.

Last year Congress, in Public Law 100-591, directed FAA to "...undertake and supervise a research program to develop dynamic simulation models of the air traffic control system and airport design and operating procedures which will provide analytical technology for predicting airport and air traffic control safety and capacity problems, for evaluating research projects, and for **testing proposed revisions in airport and air traffic control operations programs.**"

We believe the development of a realistic prototype FAA facility, as suggested above, preferably in close physical proximity to an operating ATC Center, in which every mature project to automate elements of the ATC system can be wrung out in a realistic environment, is a logical implementation of the directive Congress gave to FAA last year.

AOCI believes it is time for a specific directive to FAA, along with dedicated R,E&D funding, to make clear that real automation of the air traffic control system must now be pursued energetically, with specific near-term milestones of implementation of the latest technology and expert system science, and early demonstrations in realistic environments.

We urge this Committee to instruct FAA that construction of such an automation demonstration and validation facility is needed to achieve meaningful and acceptable ATC automation, and that such a facility is considered a valid response to Public Law 100-591.

THE NEED FOR A STRONG, SKILLED, TECHNOLOGICALLY UP-TO-DATE FAA

There has been much public discussion, recently in the Voelcker Commission, about the need to strengthen the Civil Service. FAA has suffered for some years with the problem of a growing job and a declining, aging work force which for all practical purposes could not be augmented with new blood. Contractors can do many things for FAA, but they can not substitute for a critical mass of fully competent up-to-date FAA insiders to manage and direct the crucial work it must do on behalf of aviation.

In the light of the job to be done, a way must be found to give the FAA Administrator the real opportunity to discharge or move people, as well as to promote and reward competence. Most important, he must be given the administrative opportunity and the funds to hire a substantial number of bright, young, technically up-to-date scientists and engineers to reestablish a high level of technical excellence.

Many years of personnel reductions and little opportunity to hire and reward bright young experts needed has left an FAA seriously deficient in skills it needs badly, virtually across the board. While the problem is especially acute in the areas of computer science and in the virtual absence of real research and development in the last few years, the need is equally obvious in other FAA elements.

Many of the some 650 FAA people funded under the FAA R,E&D budget have had to be assigned to other tasks, many unrelated to the needed research and development. It would seem appropriate for this Committee to be aware of this problem and assured that a critical mass of skilled FAA insiders is at work on these crucial efforts.

CONCLUSION

(1) We hope to count on this Committee's continued support and guidance to FAA to expedite the important capacity enhancement initiatives we and the Industry Task Force have identified. Full implementation of technological improvements may provide a net increase of 20 to 25 percent in system-wide airport capacity. That will help considerably, but it is only part of the solution. These initiatives must be advanced in tandem with building new runways and new airports which will provide the greatest long-term improvements to capacity.

(2) Solving the airport capacity problem will require concerted action by local communities, airport operators, the Congress and the DOT/FAA. An important first step will be the development of a strategic National Airports System Capacity Plan, backed up by a strong federal commitment of resources and funds to expand the system, and other funding mechanisms to make it happen.

(3) We believe the FAA's aviation security R&D program must be strengthened.

(4) We believe that this Committee can help assure early implementation of MLS, and help move FAA toward real, acceptable ATC automation.

(5) Finally, we believe this Committee can help FAA solve its shortage of skilled FAA insiders, a crucial ingredient to a successful agency.

Thank you. I will be happy to answer any questions you may have.

Mr. VALENTINE. Thank you, sir; both of you.

Mr. Reilly, the Industry—Industry Task Force recommended that FAA Administrator McArtor established a major external Center of Expertise from which to derive guidance and leadership on airport capacity activities.

While that did not happen, you state that contractors are now in place to perform airport capacity enhancement tasks.

Are—are contractors really a satisfactory substitute for the collective wisdom of professional airport people?

Mr. REILLY. Mr. Valentine, currently the Task Force is composed, as I mentioned at the beginning of my statement, of a number of disciplines from within the industry. We have full-time jobs. We get together once every couple of months to try to update where we are going. We have recognized during the last several years of our deliberations that currently, because FAA has been squeezed money-wise and staff-wise, that it does not have that critical mass of expertise existing within FAA to try to do the types of programming, longer term thinking that we feel is absolutely essential to get us through our capacity constraint situations we face today.

We have had, and we have seen, great success with some of the better outside contractors, the think tanks. They have full-time staffs that can dedicate themselves to focus on specifics if given good parameters within which to work.

We—we continue to feel that this is probably one of the best routes we could follow right now. The outside expert does give you the opportunity to vary your program year to year; let them worry about picking up the new experts that are required.

The only other alternative is to build that broad consensus of ability within FAA, which is going to mean a lot of money for new people.

Mr. VALENTINE. What are some of the tasks that these contractors are asked to perform?

Mr. REILLY. For example, that the Task Force has recommended to FAA?

Mr. VALENTINE. Yes.

Mr. REILLY. Well, in fact there are—there are several of the contractors that are working on some of our immediate programs. Lincoln Laboratories up in Massachusetts, they're working on terminal automation.

Bendix is working on the new airport sensors, which we feel are so very important.

Mitre Corporation, out here in McLean, Virginia, they have been working on procedures and analysis for closely spaced parallel and converging runways.

The Transportation Systems Center up in Cambridge also, which is a DOT operation, they, too, have been doing some broad work on capacity enhancement plans.

There are a number of them; some more involved than others, though.

Mr. VALENTINE. I take it you feel like that they are doing the job that the Task Force had in mind?

Mr. REILLY. They are. But still, Mr. Chairman, it's going to take some real expertise within FAA to assure that the right contracts go to the right people; that the contractors are meeting their re-

quirements and their responsibilities. So you can never do without that needed expertise within FAA to supervise and run those operations.

Mr. VALENTINE. Moving to another area. Given the—the finite level of funding for airport capacity research as in most things, would—would you agree that—that things such as airport task forces and airport capacity oriented construction of—of new operating areas and—and/or procedural changes are the most cost effective ways to proceed?

Mr. REILLY. Very much, Mr. Chairman. The procedural changes are one of the basics for all of our developing from the Task Force. We feel that for years and years we have been operating independent parallels at 4300 feet separation. We know from the simulations that have been run that it's possible to bring those separations down and still operate safely. Currently this is being done at several FAA experiments that are under way at various airports around the country that have 42 and 4300 feet separations.

Procedural changes are imperative. It's obviously, then, up to the individual airport task forces, which you also mentioned, to take this laundry list of concepts that we have developed to increase capacity and to lay those—that laundry list—over their own airport situation to determine what they can be using to their best advantage.

And, of course, the third fallout, which you also mentioned, evolving from that, is the new construction that might be necessary.

So I believe you have hit it on the head, sir.

Mr. VALENTINE. To what degree do you believe that the computed gains in airport capacity claimed for advanced technology applications will survive and—and be accrued by the users in the—in the—this uncertain and irregular world of an actual operational environment?

Mr. REILLY. I'd have to say, Mr. Chairman, that we have found very good correlation, for example, between the various computer simulations and data printouts as to what are the abilities of new concepts, i.e., independent operations of closely spaced parallel or convergings, or whatever, and the actual that has been proven out in many of these areas.

I think there's very good correlation. It certainly gives us the tools to work with from determining what are the best alternatives to pursue with the limited amount of R&D money we have, and I think this has been taken very much into consideration.

Mr. VALENTINE. Isn't it true that in the long run, both procedural and technical improvements that we've talked about here, will really just buy a little time, that we need to get—get on with planning into the future?

Mr. Poritzky, I want to talk to him some more about this interstate airport system.

Do you see that as—as something that we should be planning for now?

Mr. REILLY. Well, I think you're absolutely right, Mr. Chairman.

What the concept behind this Task Force was, was to try to bridge the gap between now and the year 2000. We need instant

fixes of massive new capacity if we're going to keep this system going.

The only real long-term solutions are what I said that seem so impossible at this time, and that is the construction of six to eight brand-new airports in this country, some 50 to 60 brand-new runways. They have to come. There should be the process put in place within FAA and DOT right now to start developing those plans for the year 2000. The best we can do is maybe get enough capacity to keep—keep the system from collapsing between now and then. But by the year 2000, we're going to need all these new ingredients.

Mr. VALENTINE. Let me ask this question to both of you. Do you—do you see this—this system of new airports—and I—of course, I wouldn't dare ask you how you would suggest that be financed.

Mr. REILLY. Or where they'd be located.

Mr. VALENTINE. If we get into that sort of thing.

As I understand it, the Federal Government is not into building airports to the extent that it is into building highways. And, you know, it boggles the imagination to think of—of our moving into that area.

However, when—when one looks today—I know I've had this experience, and I marvel at the—the good judgment, the foresight, the vision, of the people who planned the interstate highway system back 30–40 years ago and think of this country how we would be without it today. I think it is perhaps—if you look at physical things, tangible things, perhaps the single most unifying influence in the country.

But do you—are you talking about situations where you would build bigger airports where airports exist? I know that you have to put—you have to fill the need where the need exists. But are you talking about a—a dispersal or dispersement of travel by moving out into less populated areas to put these larger interstate airports? Or do you mean that there would be other airports in Chicago, Atlanta, and Los Angeles?

Mr. REILLY. Well, Mr. Valentine, at this time these are all probably just personal views to an individual.

Mr. VALENTINE. I know, I know.

Mr. REILLY. I think you're absolutely right. The process in developing our Nation's airport system to date with the local community taking the lead with FAA seed money to encourage the type of development or to force the type of safety requirements that are necessary has been very, very successful.

With deregulation, new parameters were brought to this industry. We can't keep up with the growth we face right now. Our current system of airports where some airports are locally oriented, where other airports are serving international markets as well as hubbing for an entire half of a nation as well as providing service for local communities, I personally don't feel that this type of a structure can survive in the long run.

I think it's imperative as part of that long range planning I spoke about before for new airports by the year 2000, that the comprehensive study begin now, hopefully, fostered by the FAA and/or DOT, to determine what type of aircraft we're going to have by the year 2000; where the growth is going to be; what type of new inno-

vations are going to be required that will change the complexity of an airport.

For example, will we really be doing ticketing in an airport in the future? Probably not. We'll be doing it by telecommunications.

Will we be loading baggage at airports?

The airport is going to change. The airline type of operation is going to be changing.

We have to be smart enough to start now to look into the future to see what we're planning for. And on that basis, then I think make the determination of the type of airports that are going to be required for the year 2000, 2020. They could very well be mega-airports in the middle of a desert in Arizona, in the wilds of North Carolina, that is serving all of the trans-Atlantic from Europe or from Asia. And then they'd become feeder hubs for the rest of the country with domestic traffic.

We're not quite sure that's the way the airlines, the aircraft, are heading.

I guess in—in a rambling, overly short response, that's how I'd address it.

Mr. VALENTINE. Mr. Poritzky?

Mr. PORITZKY. Well, sir, I think there are several things that can be done. Don touched on several of them. If you believe the studies that have been made on what the technology can do, that technology will provide us, if we're very lucky and if it all works as—as scheduled, perhaps 20 to 30 percent increased capacity when the need is by various and sundry projections by the turn of the century and beyond for 70 and to 80 percent.

Now, where's the rest of it coming from? The rest of it has to come from the new runways—very tough to build in a lot of places—and new airports.

What kind will they be?

My guess is that that they'll have to be of all kinds. If in a given area there is an underused airport that can be expanded, that can become a hub, that will undoubtedly happen.

If—when you consider, oh, for example, the California-Los Angeles arena, is Palmdale, which is certainly an underused airport now—but Ontario.

Are those brand-new airports?

No, they're not, they're already there.

Are they capable of being exploited?

We think so. We think we will have to do that.

I think probably we will see some of—some of each.

What we believe, however, is that there does need to be a national plan. FAA has not been very active in this arena. In the last administration particularly, there was a lot of discussion that under the new federalism, the Federal Government shouldn't involve itself in those essentially local choices.

I mentioned the NASPAC, the—the Situation Display. What it shows you, and it's very graphic, and the one example that's—that's given—that is shown in their initial demonstrations is the Denver Airport congested, and the impact of that on delays into Houston, Chicago, Los Angeles, Seattle, and so on.

The national character of the system becomes totally obvious when you look at that very simplistic demonstration. So that we think a national plan is needed.

Let me just touch on the funding question, which is one of the toughest, of course.

Airport Operators have been talking, and have talked with many people on the Hill and I hope we'll have more discussions, about the possibility of a revolving loan fund in which some of the unused—currently unused—money in the trust fund can be used as the basis for loans which can be used on a revolving basis to permit airport projects—major airport projects.

One analysis done by AOCI says that over 30 years—and this is in our testimony—the revolving loan fund could generate funds to finance $68 billion in airport construction projects, all from only a few million dollars in initial seed capital—capital from the trust fund.

We think there's a possibility here. There are other possibilities. There's the passenger facility charge. Both of these could have the effect of reducing, or giving airports, enabling airports to build new capacity themselves, possibly having an impact on the problem of concentration at particular airports that's become very popular.

So that there are ways to go about it, we think.

But the key point I think both Don and I are making is that we have to do it in an organized way. There is a national concern, and that's the point we're trying to make.

Mr. VALENTINE. Right. I don't think there's any question about that.

Since—and we'd better be—better be planning.

Since most of these, Mr. Poritzky, since most of these MLS benefits, that is to say, the least noise pass—path—missed approach guidance, and so forth, are accrued by the public, that is, airports, ATC, noise impacted communities, and so forth, should the Federal Government subsidize or even reimburse aircraft operators for the costs associated with equipping their aircraft with these devices?

Mr. PORITZKY. I'm sure it would be lovely. I think—my guess is it's also highly unlikely. That same idea has been thought of in times past for other safety devices.

My own belief is, and the view of the Airport Operators, is that airlines and the aviation system have a great deal to gain from implementation of the Microwave Landing System. Let me just cite two examples.

Don talked at length about the problems of closely spaced parallel and converging runways in his testimony. I've talked about it in ours.

The capability of the Microwave Landing System to provide for lower minimums converging approaches, by providing precised missed approach and departure guidance, will produce, in my view, will produce lower minimums. Lower minimums translate into money for airline operations.

MLS will provide—and I think that's been demonstrated and analyzed till we're all sick of it, probably—will provide additional capacity in terms of creating multiple arrival streams to airports and runways. That translates into money.

Perhaps said most simply, the ILS—which has been around since just about World War II, and has improved a great deal in the meantime—remains a nervous system which does not provide very straight beams, whereas, MLS—and this was its intention—provides very high integrity beams, the least of which—the least expensive versions of which—provide performance to Category 3 capability, as FAA describes it, virtually to threshold every time.

We believe that from—now looking at it from the user's vantage point, not the airport's—it will make possible simplified flight control systems, better autopilots and the ability to hang onto that beam practically to touchdown. That's a safety gain, that is a capacity gain, that's a money-making gain. Obviously, from our perspective, from AOCI, we hear from airport neighbors a lot and, therefore, we would tend to concentrate on those aspects of the system that can help us with the noise problem and with the ability to get more efficiency out of the airport operation.

Mr. VALENTINE. You've stated, Mr. Poritzky, that a synthetic vision capability would probably serve only as a backup to a primary instrument landing system.

If that's the case, there will be no system operational enhancement. If so, why should the FAA continue to direct already limited R&D funds to this kind of a project?

Mr. PORITZKY. Mr. Chairman, I think the idea of synthetic vision, which has been a dream, and I think probably in every pilot's head since the Wright brothers, is a technology that if it can be developed—and much, much work, as you know, has been done in the military on synthetic vision devices—if it can be developed, I would virtually guarantee that it will find its way into airplanes.

Does that require FAA funding? Probably not.

What does, I think, or what should require FAA funding is not the development or the invention of these things—that's been done, or is being done if it can be done—what does become a matter of concern is to assure the safety of these systems. Like cockpit traffic displays—not the traffic display you'll see tomorrow, but cockpit traffic displays—they can readily be misused. They can be of tremendous value but they also have a potential for misuse.

I would argue that it is an appropriate role for FAA, particularly in the safety assurance area, to—to understand these devices well enough to assure that they—that they are designed so that they cannot be misused.

Mr. VALENTINE. The FAA seems to be spending more and more research dollars and manpower on developing better radar systems, and better communications systems, and better navigation systems.

By—by how much will these projects enhance the ability of the—of the ATC system to—to process more aircraft given the conditions which exist today?

Mr. PORITZKY. I don't know, Mr. Chairman, that I could put a number on that. I want to say a lot. If—if it's in fact the case, as we all believe it is, that there is a lot of traffic out there and more coming, then we have to make improvements on all elements of it. And I would break it down perhaps into five areas: navigation, communications, surveillance, weather, and automation; automation with information exchange.

Every one of those things has to be improved. There has to be an almost continuous process to take advantage of the latest technology.

I would argue, I think, that we have not done nearly enough research and development with product orientation—something that comes out, that it is really 10 percent better than the old one—to take advantage of what technology can bring.

I would argue that the greatest need and probably the greatest weakness is in the automation and information exchange area. It's a very tough one. But it's one which requires the student—in this case, FAA—to look at the system very broadly. The big gains, in the eyes of a lot of people, in capacity will come from the wise application of automation and data information exchange.

So that, to sum it up, I think we need to attack all of these. The ones that, perhaps, have the greatest prospective payoff and, therefore, need the greatest amount of attention are automation and information exchange.

Mr. VALENTINE. I don't know whether it's just a rule—rule of thumb in these various industries or whether it's a coincidence, but I toured a—a research facility in Research Triangle Park in our district within the past week and was told by the person there that most, if not all, of the equipment in that tremendous building would be obsolete about a year and a half after it was purchased and put in place.

Now, do we face—or don't we really face that same prospect with respect to all the great things that we've been talking about today, that devices and contraptions to make air transportation more efficient and much safer, we are facing the—are we going to face the proposition of having to spend money continually in the future to keep this up?

Mr. PORITZKY. I—yes, sir, I think that we will face that problem. Yet, I would argue, I think that things do not move all that rapidly. We've talked about the Microwave Landing System here. We started working on the Microwave Landing System—and I should have qualified myself earlier, I've been involved in it since almost the Wright brothers. We started working in 1967. FAA began its development program in 1970. It is now 1989. It hasn't moved very rapidly, to our—to our collective sorrow, I think.

The airplanes we were talking about earlier, the aging—we're talking about geriatric airplanes, 25 years old, 30 years old, possibly older. So that, yes, do things obsolete more readily? Of course, they do.

The replacements, however, will be done based on the fact that the new ones are enough better to make it worthwhile. FAA is undergoing a replacement program for its—its air traffic control computers. I think the NAS Stage A computers are now probably 20 years old.

Should it take that long? No, we're not taking advantage of the technology.

Can it be done faster? Maybe in 10, yes; 12.

Will it be very fast? Not in the world we live in.

Mr. VALENTINE. Is the FAA directing an adequate amount of management attention to dollars and manpower toward enhancing

the operation—operational—efficiency of the ATC system, in your opinion?

Mr. PORITZKY. No. I think, as Mr. Kolstad said earlier, it's never enough.

We've suggested in a number of cases, in the brief comments that Don made and I made, that more money and more effort, more people, need to be put on the job. I've touched, as I've said, on automation and information exchange where there needs to be strengthening, both in the funding and in the number of people.

Aviation is a very, very large business. And in my view, in the research and development we have short-changed it. FAA is running, as Scott said before this hearing began, FAA operates a system that has to run 24 hours a day, never allowed to hiccup. That's a very, very tough job.

I think we have to keep working to give them the tools. They have to be given the money to build the tools to improve it.

Mr. VALENTINE. As you pointed out, the ATC system is—is a collection of—of functions working together.

Is the FAA developing ATC automation capabilities with the—with a corresponding sense of system, in your opinion?

Mr. PORITZKY. No. I think the most recent FAA reorganization of many, tends to begin to recognize that problem. I think, again, in the—it's really the key to the point I was making earlier on information exchange and automation. That's where the resources have to be spent, both technology-wise and organizationally.

FAA's organization is very, very complex. We think—and I hate to even think of the possibility of another reorganization; they seem to happen with great regularity—but I think FAA will, must, is beginning to understand that it is really an integrated system. We have to look at it that way more and more. That's where our future lies.

Mr. VALENTINE. Thank you.

Mr. Lewis?

Mr. LEWIS. Thank you, Mr. Chairman.

Gentlemen, the—I'm very interested. I read most of your testimony and it's very impressive. It sort of runs parallel together.

I'd like to ask you on—a hub away from a heavily populated area has been proposed as a solution to some of our airport problems.

Do you think this is a possibility when you take into consideration that about 40 percent of the profits are from concessions, rental cars, et cetera, at airports?

Either one. Mr. Reilly, Mr. Poritzky?

Mr. REILLY. I might begin by mentioning that where you find that a major airport—and it is correct that perhaps 40, perhaps even 50 percent, of the income to take care of the expenses of operating the airport come from concessions, i.e., other than airlines.

That amount can probably go up to as much as 70 or 80 percent at some airports.

But it is a case that the passenger's paying that bill, whether he's paying it through fees to concessionaires, through purchases, or to the airline directly through the purchase of the ticket.

We've been very fortunate in having an industry here that has been able to sustain and support itself over the years. I personally feel that if we can come to terms and to grips with the type of

future airport we're going to need, we will be able to fund it from within the industry.

Mr. PORITZKY. Let me just add something to that because I agree with it.

I mentioned earlier that I think we will need some of each flavor. I think that the—we've heard recently of superhubs, of the TRB term—Transportation Research Board term was alternate transfer airport. We've heard of wayport.

Basically, they're all the same animal. They are all distant from population centers.

It is true that there have been very few, if any, airports built, ever, in this country which did not have access to some origin and destination base; that weren't close to a population center. That creates—obviously, that creates problem—problems for the airport, which is in a remote area.

However, we may find for some international operations, perhaps some transcontinental, that enough people will want to use such an airport as a transfer location only, that it will make sense.

Financing is a very serious problem. Usually airports are built with bond issues. If there ain't any people around, it will be very hard to sell the bonds. Somebody then comes to the Federal Government to say, how would you like to? And you can imagine what the answer is.

I think we may see some of those but I think there are many ways to get capacity. We've tried to describe some of them. We will need some of each.

Mr. REILLY. Mr. Lewis, just as an add-on to that, I did—I didn't hear the problem—you said wayports away from populated areas. You must remember, there are also new advantages and disadvantages there. All of a sudden a wayport built out in the middle of nowhere, you don't have the significant aircraft noise problems that you are faced with with close-in airports. It's a great advantage for continuous expansion to take care of the capacity needs.

On the other hand, though, you do have new problems, i.e., high speed access to such airports. If, in fact, any of those people are leaving the airport for any local destinations, that is a problem, unless it is a true wayport by some definition that it's an interchange merely to other airports; and you really don't have a service of O&D at that point. So it runs the gamut.

I do believe, though, that on the funding we're just going to run out of space at many major airports at large cities—Los Angeles International and JFK, et cetera. You just can't pump enough money into those anymore to get new capacity.

Currently there's a $1 billion development program going on at JFK that's going to solve a lot of the internal ground transportation problems. It's not going to add very much air capacity if any, though.

And that's one of the things we have to be looking at and considering. This is why, and I believe it was while you out, I mentioned that DOT/FAA should start today to do a comprehensive planning for the year 2000 and 2020. What kind of airports are we going to need with what types of ingredients to be built into them.

Mr. LEWIS. This is a—this was my next comment on the—the question. When you look at the crowded areas that we have right

now, we do have a very difficult time in enlarging any airport, and I don't know too many places you can go in this country that some part of an airport isn't under construction for the growth.

With the noise problem that we have and the environmental problem, has your study, at all, taken into consideration on the relocation with either hubs, wayports, or even relievers, what have you, or even a close down of a major airport into—and moving and building a regional airport? Have you looked into these problems?

Mr. REILLY. I think this is pretty much done on an individual city-by-city basis. And I think we have in hand the most recent example, which is the Denver, Colorado situation. Denver became a very—an airport with great capacity problems. The local community went to the mat and came up with a new site, an expanded site, for a brand-new airport that would not have the severe noise problems, et cetera. While everyone in the industry, including the airlines, have as a paramount projection the need for more capacity, you then start getting into the in-fighting.

There is a built-in ingredient right now which is stymieing new airport capacity in this country, and that is that with the situation having developed where one or maybe two airlines now have a great proportion of their service emanating from any one city, they don't want to see new capacity necessarily because the new capacity, beyond their own needs, will lend itself towards bringing in competition.

Now, that's not a nationwide rule; it does exist. We have found, and at least some of the people at the local level in Denver, advocate that two of the large carriers involved with the Denver situation are now balking at the new airport for fears of great new capacity being generated for competing airlines.

I personally think that there—this is one reason why under the new ground rules of deregulation that airports are either going to have to be given more direct control over their destiny or; (2) the Federal Government is going to have to step in and do a lot more of the national long-term planning for our system.

Mr. LEWIS. The—this is certainly—I've seen this happen at one airport that I'm aware of. In our legislation we passed, we basically stated that the FAA will have to conduct research and develop dynamic simulation models both in their air traffic control system and airport design.

In your studies and—have you looked at some of the problems we're going to run into with—particularly in the air traffic control area into some of these airports with short takeoff and landing and helicopters, say, in the next 10, 15, 20 years?

We're going to see more of that in and out of the main areas of some of our cities. And I've been told many times that this could be a real nightmare just to get the bugs worked out to make it work.

Mr. REILLY. Mr. Lewis, right now you'll find that most major runways—the 10,000 foot, 8,000 foot runways—at most airports are pretty much approaching their total capacity constraints.

This is why as part of the Task Force Initiative we have looked into the integration of short runways to try to take off the general aviation or commuter traffic to not needing the large runway but being able to operate from a 4,000 foot, 5,000 foot runway.

Going back to the MLS concept, the other navigational concepts, the new sensors that are—we're trying to have developed for greater progression in this area. We have got to devise the ways to incorporate into the different forms of runways as well as into the different types of airports, the types of traffic, that are best utilized. We will have a tremendous increase in helicopter operations and VSTOL, short takeoff and landing aircraft, in the future.

These perhaps offer some of the better gains for new capacity because you can't get any more operations onto some—most of your major runways at major cities. So you're going to have to look to these other alternatives.

They are very expensive. Helicopter operations today, everyone keeps waiting for the economic breakthrough to make them economically viable. A lot of people still see that happening. But the other side of the coin is that because of the capacity constraints it's going to be so expensive to get more flights in over there, that maybe you can all of a sudden start affording the—the helicopter type operations or whatever.

So, yes, in the future it's definitely a component of the overall capacity and aviation growth.

Mr. PORITZKY. I would argue, Mr. Chairman, that—Mr. Chairman, Mr. Lewis, that tilt rotors, short haul aircraft , helicopters, are going to be the savior in the big cities. I think they are not going to be a nightmare. It's much easier to provide a short runway than it is a long one. The work—the technology work that's going on will permit closer spaced operations, will permit independent arrival streams.

I have to come back again—and I don't want to sound like a broken record—the thing that will make it a nightmare, if we don't provide the tools for the controllers to run that system, the idea of using, fully utilizing, short runways, helicopters, tilt rotors, will work, will provide additional capacity. But we have to introduce for the controllers enough help, through automation, through better surveillance, through the kinds of tools that will let him appreciate the situation through better automation, better data processing, and better information flow, as I said earlier.

I think that is indeed where our salvation lies at the big airports. It won't be enough still, but I think it will be a tremendous gain.

Mr. LEWIS. Thank you, gentlemen.

Thank you, Mr. Chairman.

Mr. VALENTINE. Thank you, gentlemen, very much.

Mr. REILLY. Thank you, Mr. Chairman and Mr. Lewis, we've appreciated the opportunity.

Mr. VALENTINE. We're ready now for Panel No. 2, Civil Users of the National Airspace System. And this panel consists of Mr. J. Roger Fleming, Senior Vice President, Technical Development and Planning, Air Transport Association of America; Mr. Steven J. Brown, Vice President, Strategic Policy and Planning, Aircraft Owners and Pilots Association, and Mr. John O'Brien, Director of Engineering and Air Safety, Air Line Pilots Association, International.

Welcome. Your prepared statements will appear in the record and as they have been presented to us and feel free to summarize

those, and be prepared to answer any questions that we might have.

I guess Mr. Fleming goes first.

STATEMENTS OF J. ROGER FLEMING, SENIOR VICE PRESIDENT, TECHNICAL DEVELOPMENT AND PLANNING, AIR TRANSPORT ASSOCIATION; STEVEN J. BROWN, VICE PRESIDENT, GOVERNMENT AND TECHNICAL AFFAIRS, AIRCRAFT OWNERS AND PILOTS ASSOCIATION; AND JOHN O'BRIEN, DIRECTOR, ENGINEERING AND AIR SAFETY DEPARTMENT, AIR LINE PILOTS ASSOCIATION

Mr. FLEMING. Thank you, Mr. Chairman; I will summarize.

We see significant opportunities to advance important safety and capacity projects within the scope of the FAA's RE&D program.

First, I'd like to note that 1989 appears to be a year of transition for this RE&D program. Most importantly, of course, the Aviation Safety and Research Act of 1988 was enacted. This Act, among other things, authorizes higher expenditure levels for important RE&D efforts, requires FAA to prepare a National Aviation Research Plan, and requires the Administrator to establish a Research Advisory Committee.

FAA is working aggressively to comply with these mandates and, of course, you will hear more tomorrow about how successful or unsuccessful they have been.

I think there are two important things that this subcommittee needs to consider and to recommend to the FAA and to the Research Advisory Committee as they further develop the National Aviation Research Plan.

First, they need to establish realistic research priorities to emphasize projects where the potential payoff is the greatest in terms of capacity gain or safety enhancement. Too often in the past, I think, there has been too little resource spread across too many projects, and the net result is that not much gets accomplished.

Second, we think the FAA needs to re-orient their programs to emphasize for those projects, where it's appropriate, prototype equipment for field trials. Again, there have been too many paper studies in the past where researchers and program managers tend to go back and try and reinvent history, particularly when those personnel in the FAA have changed jobs from time to time. We don't need to reinvent everything.

FAA needs to set results oriented objectives, design and implement prototype equipment or procedures to satisfy the objective, and conduct field trials. If the trials are successful, the agency should be prepared to move immediately to acquisition and implementation in the NAS system, in cockpits, or on the ground.

Several examples come to mind. First, the high data rate sensor for monitoring closely spaced parallel approaches at Raleigh-Durham, I think is a commendable example where the FAA has essentially done what I just recommended.

A second one comes immediately to mind. You heard it—about it—from Mr. Kolstad and Mr. Laynor of NTSB, and that concerns the runway incursion management system that has been proposed as an add-on to the FAA ASDE-3 contract. That looks to us, and

you may have noticed this in our statement, as a project which could be brought to fruition quite quickly at relatively modest additional cost. The system may not be perfect but it may be a significant contributor to improve state—safety.

My statement includes a number of recommendations for research program enhancements where objectives can be identified. High priorities, in our opinion, are deserved, and prototype solutions could be developed for field trial or implementation.

In the safety area, I believe every one of the recommendations in my paper was also called out by Mr. Kolstad of NTSB, including the one I just mentioned concerning runway incursion management.

In the systems capacity area, we support the recommendations that have been advocated by Mr. Reilly of the Delay Reduction Task Force and most of those which have been advocated also by our colleague Sieg Poritzky of AOCI.

Finally, in closing, Mr. Chairman, I'd like to echo a statement made by Mr. Poritzky concerning the need for FAA resources.

There are not sufficient FAA personnel with the appropriate tele—technical qualifications to support the programs that we would all like to see executed.

You have a gentleman sitting at your right hand who is intimately more familiar with that state of affairs than am I, but I think we would generally agree, all of us at this table, with that need.

We recommend that FAA review their research staffing and facilities requirements and report those needs to this subcommittee so that if there is clear agreement on those needs, then hopefully we will all, working together with your leadership, be able to do something to rectify those shortcomings.

With that, Mr. Chairman, I would close and pass on to my colleague, Mr. Brown, with your permission.

[The prepared statement of Mr. Fleming follows:]

Statement of J. Roger Fleming,
Senior Vice President - Technical Development & Planning
Air Transport Association
Before the House Committee on Science,
Space and Technology, Subcommittee on
Transportation, Aviation and Materials
on FAA's Research, Engineering and Development Program
April 11, 1989

Good afternoon Mr. Chairman. My name is Roger Fleming. I am Senior Vice President, Technical Development and Planning of the Air Transport Association, which represents 21 U.S. scheduled air carriers. I appreciate the opportunity to appear here today to give the subcommittee our views on the FAA Research, Engineering and Development program and level of effort for fiscal year 1990. My testimony will address overall funding concerns and highlight safety and system capacity needs.

ATA believes there are priority areas in FAA's Research, Engineering and Development program that require added emphasis. Additional funding this year could make a significant difference in bringing needed capability on line sooner. Projects deserving emphasis fall into two general categories: safety and system capacity.

Projects that could have a beneficial effect on safety include: TCAS, airborne windshear detection, icing protection, runway incursions, aviation security, human factors research, and aging aircraft.

We believe the key to improving system capacity lies in developing more efficient operations in terminal areas by accelerating a number of promising airport capacity projects and

automation of terminal air traffic control. In addition, analysis tools, such as modeling and simulation, need to be refined and more widely used.

Level of Effort/Budget Request

While the overall FAA budget request for FY 1990 is $1 billion higher than the enacted current budget, the $165 million Research, Engineering and Development (R, E&D) portion is only 3% ($5 million) higher than the FY 1989 spending levels. The Aviation Safety Research Act (ASRA) of 1988 authorized significantly higher levels of expenditure for important FAA R, E&D efforts. We wholeheartedly support the increased funding levels contemplated in the Act. Congress wisely recognized the need for a greater R. E&D commitment. However, it is clear that the $165 million request for R, E&D in FY 1990 falls far short of Congressional intent and industry needs.

Our analysis of the FAA FY 1990 R, E&D budget request compared to the FY 1989 program shows that the FAA has increased requests in the following general areas by the amounts shown:

	Millions
• Air Traffic Control	$4.5
• Aircraft Safety	4.2
• Aviation Medicine	0.4
• Aviation Weather	0.4
• Environment	0.1
Total	$9.6

The Advanced Computer and Navigation programs which directly impact system capacity have been reduced by $4.4 million and $200,000, respectively, for a total of $4.6 million. Thus the $5 million increase in FAA's request over last year's appropriation was achieved by increasing funding in five program areas and reducing funding in two areas. The level of effort in a number of program areas, as reflected in the FY 1990 budget request for FAA R, E&D, is inadequate. I would like now to comment on major programs areas.

AVIATION SAFETY:

ATA believes the following R, E&D projects should be accelerated by funding at higher levels for FY 1990 than proposed in the Administration's budget request (the amounts listed are recommended funding increments):

	Millions
• TCAS Operational Evaluation	$ 3.0
• Aging aircraft	7.0
• Aviation security	10.0
• Airborne windshear detection and LLWAS integration	4.0
• Aircraft icing protection and forecasting and runway traction	3.0
Total	$27.0

The additional R, E&D funds are needed for:

TCAS II Operational Evaluation:

- To conduct a one year operational evaluation of TCAS II in airline service.

- To collect and analyze data and crew comments during the first year of implementation to identify and resolve any display, human factors, logic or other technical issues.
- To collect and analyze ATC radar track data and voice communications recordings to resolve TCAS and ATC interaction issues that may arise.

Aging Aircraft:

- To implement those recommendations of the Government/ Industry Airworthiness Assurance Task Force related to the R, E&D program. Activities to be funded would include methods for detecting and preventing corrosion, cracks and disbonds, fatigue life assessment, advanced, automated non-destructive inspection and human factors aspects of aircraft inspections.

Aviation Security:

- To complete of development of effective and efficient thermal neutron activation (TNA) sensors and accelerate development of vapor detection and other technologies for detecting explosives in the aviation environment.

Airborne Windshear Detection and Integration with LLWAS:

- To accelerate the FAA/NASA/industry program for flight testing of promising airborne remote windshear detectors and cockpit displays for windshear avoidance.
- To develop timely flight crew information systems, using data link capability.

Aircraft Icing Protection and Forecasting:

- To accelerate the current FAA/NASA program to include development of advanced deicing fluids for all aircraft categories and to examine the effects of such fluids on runway traction.
- To expand the existing short-term inflight icing forecasts to the ground environment so that maintenance and flight crews can make timely decisions on the use of advanced fluids.

Human Factors

The funding requested for human factors research appears to be adequate, although some modest acceleration might be possible with increased funding levels. The five-year "National Plan to Enhance Aviation Safety Through Human Factors Improvements", developed by ATA and other members of the aviation community, recommends FAA/NASA funding at $25.2 million ($11.0 million FAA, $14.2 million NASA), essentially equal to the authorization in

the ASRA. FAA has requested $11.2 million. On May 19, 1988, FAA and NASA signed a five-year interagency agreement that supports the National Plan. We urge you to help to ensure full FAA and NASA funding to support the Plan's objective of reducing accidents caused by human error by 50 percent. The FAA budget should be increased to augment any shortfalls in the NASA budget for this program.

Runway Incursions

We wish to highlight an immediate opportunity to reduce the threat of runway incursions. The FAA's Airport Surface Detection Equipment (ASDE-3) contractor has developed promising technology - Runway Incursion Management (RIM) using Independent Research and Development funds. FAA R, E&D funds in the amount of $250,000 are required to support a full demonstration at the Greater Pittsburgh International Airport. This amount is included in the Airport Surface Traffic Automation enhancement (total of $1,500,000) recommended in the following "System Capacity" section. We anticipate that a successful demonstration of the RIM technology will result in addition of this capability to production ASDE-3 equipment.

It should be noted that all of the safety programs highlighted in this statement are included in the airlines' safety agenda for 1989. A copy of the 1989 ATA Safety Agenda is attached.

SYSTEM CAPACITY:

We support the recommendations of the Industry Task Force on Airport Capacity Improvement and Delay Reduction for FY 1990 budget increases in airport capacity R, E&D. The FAA has requested $25.1 million. The airlines recommend an $18 million increase in the following areas:

	Millions
Reduced runway occupancy time	$ 3.0
Airport pavements	2.0
Precision runway monitor	2.5
Simulation model development	.5
Wake vortex	3.5
Airport surface traffic automation	1.5
Terminal ATC automation	5.0
Total	$18.0

The ASRA calls for the Administrator to undertake or supervise a research program to develop a dynamic simulation model of the air traffic control system. The FAA should begin to provide this capability. The needed facility could be collocated at the FAA Technical Center in Atlantic City, N.J. to take advantage of existing capabilities. Current NASA ATC simulation facilities at Ames and Langley should also become an integral part of this new national capability. Only with the existence of such an integrated facility will the FAA and NASA be able to properly integrate work on future ATC systems (especially the human factors aspects of controller and pilot roles in a more highly automated system). A national simulation facility would also provide an improved capability for assessing

safety and capacity enhancements to the current system and for testing alternative technological opportunities. Coincidentally, the national facility would also provide NASA with an opportunity to examine future system operations beyond the year 2005, including high speed civil transport operations.

The basic thrust of FAA's system development activities during coming years should be a systematic and efficient examination of new safety and capacity functions to deal with the ever-increasing demand placed on the ATC system. A national dynamic simulation facility is the appropriate mechanism for expediting this much needed capability. We believe that the FAA should receive $12 million in FY 1990 to begin this activity.

Research Priorities:

The airlines recognize that there is a limit on available R, E&D funds, facilities and personnel. We have recommended that FAA establish R, E&D priorities that would serve as a basis for assessing the potential benefits of the research on system safety and capacity enhancements. This approach, which was universally recommended at the FAA December 6-7, 1988 Research, Engineering and Development Conference, has been embraced by FAA. We understand the agency plans to identify priorities at the project level in future R, E&D plans.

Research Advisory Committee:

The ASRA requires FAA to develop long range plans, submit periodic progress reports to Congress and establish a 20 member Research Advisory Committee. ATA supports these provisions. We are pleased to see that the FAA under the leadership of Mr. Joseph Del Balzo, Executive Director for System Development, is moving quickly to establish the Committee. We believe this body will be beneficial in establishing research priorities and in focusing the direction and objectives of FAA's long range R, E&D efforts.

Resource Requirements

While the airlines advocate the added R, E&D funding described above, we are also aware that the number of FAA research personnel with appropriate technical qualifications has not kept pace with demand. We recommend that in parallel with establishing research priorities, the FAA review their research staffing and facilities requirements and report those needs to this Subcommittee.

Conclusion

Mr. Chairman, 1989 is a year of transition for the FAA R, E&D program following enactment of the Aviation Safety Research Act of 1988. FAA is now committed to important safety and capacity related research programs and to consideration of

long range needs. We believe the most important objectives during this transition period should be:

- the establishment of specific research objectives and priorities, with the assistance and advice of the Research Advisory Committee;
- insuring that sufficient resources are applied to the high priority projects so that a productive result can be achieved;
- and reorientation of research programs to produce, where appropriate, prototype equipment for field trials.

FAA program managers should be held accountable for producing results that can be implemented in the field or terminating promptly those projects which are unlikely to produce a useful result. The agency must insure that a "critical mass" of government and industry resources - funding, facilities and personnel - are brought together to produce solutions to satisfy important research objectives. It is in this spirit that we recommend that this Subcommittee join us in seeking a $57 million increase above the $165 million R, E&D request now pending.

On behalf of the member airlines we appreciate the opportunity to present views on the FAA R, E&D program. This concludes my prepared statement, Mr. Chairman. I will be happy to respond to any questions you may have.

Attachment

ATA SAFETY AGENDA FOR 1989

I. Safety of Flight Operations

A. Reduce risk of mid-air or ground collision

1. Conduct significant fleet sample operational validation of TCAS II. Seek prompt resolution of TCAS II configuration control, certification and implementation schedule issues. Work cooperatively with FAA and other industry bodies to complete development of TCAS III specifications.

2. Undertake rulemaking action to ensure that air carrier aircraft arriving and departing large and medium sized airports will be operating in airspace requiring automatic altitude reporting equipment for all aircraft.

3. Seek ATC system enhancements that will provide VFR Mode C intruder conflict alert service and conflict resolution advisories for terminal and enroute controllers prior to implementation of the Advanced Automation System.

4. Participate with FAA in "Special Focus" assessments of key terminal areas to identify equipment and personnel requirements as well as airspace modifications and operator and air traffic procedural changes to reduce operational errors.

5. Seek government/industry solutions to reduce incidence of runway incursions that might cause collisions on the ground, including airport surface detection equipment where appropriate.

6. Identify and pursue an action plan to improve pilot/controller communications discipline with specific near term emphasis on solutions to the confusion caused by similar airline call signs.

7. Seek full capability precision approach systems for new and existing runways so as to provide the highest level of safety during periods of reduced ceilings and visibility.

8. Seek needed amendments to FAA criteria for Terminal Control Areas and related regulations.

B. Continued Airworthiness of Aging Aircraft

1. Develop a prudent and proactive schedule of maintenance, repair and modifications of aging aircraft that will ensure continued airworthiness throughout the operational life of those aircraft.

C. Reduce windshear and other severe weather risks

1. Work actively to achieve deployment of improved and expanded windshear ground sensing capability (LLWAS and Terminal Doppler) and development and implementation of better means of communicating windshear and other severe weather warning messages to pilots.

2. Stimulate the development of airborne windshear detection equipment which provides pre-entry warning information to the cockpit.

3. Take the lead to introduce new aircraft ground de/anti-icing fluids, equipment and procedures to extend aircraft protection during winter operations.

D. Ensure implementation of Joint Task Force Crew Performance recommendations for pilot training and checking.

E. Identify means to best assess flight crew adherence to standard operating procedures; identify developing trends that may warrant corrective measures.

F. Pursue methods and procedures to use analysis of flight data recordings to identify and correct deficiencies in pilot training programs.

G. Seek federal funding to support the National Plan to Enhance Aviation Safety, focusing on needs identified in the ATA priority human factors work program. Foster cooperation between FAA and research organizations to insure productive results.

H. Implement domestic customer and industry awareness programs to improve U.S. air safety by promoting shippers' and passengers' compliance with dangerous goods requirements.

II. Safety in the Cabin

A. Encourage the required research to determine the standards for safer passenger and crewmember seats and protective breathing equipment for crewmembers.

B. Ensure DOT rules regarding carriage of the handicapped satisfy legitimate needs of handicapped passengers without degrading the level of safety afforded all passengers.

C. Reduce the danger potential of cabin fires.

1. Investigate possible causes of fire penetration of cabin interiors to determine effective design changes to minimize that fire hazard

2. Evaluate FAA/CAA Industry water spray equipment that inhibits penetration of fuel-fed fires into the aircraft cabin.

3. Determine the effectiveness of advanced in-flight smoke venting sytems for eliminating cabin smoke emitted by hidden fires.

D. Develop FAA/Industry R & D plan to evaluate self-sealing breakaway fittings for fuel systems.

E. Identify and pursue fireworthiness and crashworthiness R & D programs that have the most promising cost effectiveness benefit; seek a leadership role in FAA's Aviation Safety Research Advisory Committee with which is to be established by the Aviation Safety Research Act of 1988.

III. Strengthening FAA/Industry Security and Anti-Terrorism Measures

A. Coordinate airline participation in operational tests of FAA-approved explosive detection units.

B. Identify and seek implementation of improvements in the airline passenger screening process.

C. Promote the establishment and effectiveness of local ATA Security Committees at major U.S. airports.

IV. Improved Safety Data and Safety Program Management

A. Implement an automated industry safety data base that would permit collection, analysis and dissemination of timely accident/incident information.

B. Develop guidelines for internal safety audits by airlines to insure compliance with all FAA regulatory requirements as well as to more effectively monitor incidents or other developments that may indicate need for special corrective action.

C. Cooperate with government and industry to identify improved indicators of the current level of safety in the air carrier industry.

V. Increase Public Awareness of Airline Safety Programs and Accomplishments

A. Continue a strong public information program to assure broad understanding of the airlines' highest priority commitment to safety and the safety activities of the industry. This program is to be conducted in conjunction with efforts to increase public and Congressional awareness of the need to enhance safety and expand the capacity of the nation's airports and airspace facilities through modernization.

Mr. VALENTINE. Mr. Brown.

Mr. BROWN. Thank you, Mr. Chairman and Mr. Lewis.

I am Steve Brown, Vice President in Government and Technical Affairs for the Aircraft Owners & Pilots Association.

The AOPA represents 285,000 individuals now who fly general aviation aircraft for personal and business transportation.

According to the FAA's latest statistics, we represent approximately 40 percent of the total pilot population, and we welcome your invitation to appear here to comment on the FAA's RE&D program.

Our analysis of their program this year is contained specifically in an appendix to the statement and I'll summarize the highlights of the statement this afternoon.

But we feel in general that the broad initiatives that FAA has outlined are well targeted and that in fact they do have a strategic plan and set of objectives that they're trying to manage to. Now while that's true, there are clearly efficiencies that can be created in their program management, and I'll refer to some of those. And in addition, there are some selected areas where there are shortages of funding on specific programs.

We're very concerned that an apparent gap that could develop between the funding levels in terms of appropriations and the authorized levels could in fact seriously jeopardize, in our view, the ability of FAA to deliver critical future technologies in time to meet accelerating national capacity needs.

As an example of this, Mr. Chairman, I'll go back to something you mentioned earlier, and that is the need for an overall strategic national plan that develops national airport objectives. We have called for a national aviation policy and, of course, we're all aware in the industry that Secretary Skinner is preparing the development of a national transportation policy, and clearly addressing airports and local control and the development of future capacity is a critical element in that and we must have that addressed.

Hopefully, with your leadership and the subcommittee, and also the—the new administration leadership, we'll be able to cross that hurdle this—excuse me—this session of Congress.

One of the things that we're very concerned about, Mr. Chairman, is that without these kinds of solutions, the view that Don Reilly and Sieg Poritzky mentioned specifically, we're in danger of creating second-class citizenship in this country, not only for the air traffic passenger but for general aviation pilots as well.

We must have sufficient airport capacity to connect the smaller communities to the larger communities, and clearly, FAA's research and technology can develop many of the solutions to those problems.

We feel that FAA must develop and deliver on-time solutions which have real and near-term results. And many of those in the airport area were referred to by our colleagues and we support those. As you will note, Mr. Reilly mentioned where a member of the Task Force and support those conclusions.

Without the implementation of those specific programs and progress being made on that research, we're fearful that our national aviation system will continue to deteriorate under the rationing and constraint that we've seen in past years. And clearly,

with FAA's tendency toward a daily and hourly tactical decision-making process instead of a commitment to long-term research, which provides a strategic solution, we're going to have severe problems that will undermine our Nation's commerce if we can't beef up our technological capabilities.

Now the specific programs that we're most concerned about are really two: the Aviation Weather Program, where we've seen services deteriorate over the years severely, not only in the Flight Service Station Program but also in terms of NWS services, which provide forecast products for pilots and other users in the system.

We've seen this administration begin down the wrong road on that path and we solicit your help in trying to overcome that problem.

We're concerned about the provision of weather services for the simple reason that weather is involved as a factor in four out of every ten general aviation fatal accidents; and over a period of years has been a factor in two of every ten non-fatal accidents.

So clearly, from a safety perspective, weather information and accurate forecast data, including the enhanced radar products that FAA's working on in their RE&D programs, are critical to general aviation safety.

In addition to these safety considerations, weather is critical simply because it represents a factor in 60 percent of all the delays in the system. And for that mere reason, in order to increase efficiency and capacity, we must have these improved weather products available.

Secondly, in the navigation area, Mr. Chairman, we feel that the long-term research needs have to be increased in order to support the development of a future satellite system. Satellites offer great promise for improvements in all areas that are critical to air traffic control from communication and navigation through surveillance needs.

Clearly, this research must begin and must be supported more strongly. In fact, there's an identified need for $23 million over the next three years. Unfortunately, in the FY '90 program, FAA's dedicated only two percent of their total budget toward these critical long-term needs.

There's some other programs, Mr. Chairman, that I won't dwell on that we feel have not received sufficient funding in the FY '90 plan. I'll mention four of those specifically: the GPS/Loran C integration—for sole navigation purposes in the future; low altitude communications and surveillance capabilities that would serve both VFR and IFR aircraft in the system; the Icing Forecast Model—again in the context of the weather discussion in terms of safety and accident prevention and; lastly, the FAA's proposed simulation study that would determine hubbing's impacts on capacity in the system.

In summary, Mr. Chairman, we feel that essentially the administration has underfunded, or requested an underfunding of the FAA budget by at least $25 million; and in our Appendix we identify where many of those areas are.

We believe that these funds should be released from the Aviation Trust Fund, and can be made available. As users, we feel a little self-righteous, as you probably realize, in allocation of the Aviation

Trust Fund. Our feeling is that these monies are on deposit were paid by the users—those of us here at the table and the passengers—and that they ought to be allocated in a rational and realistic way to support not only research but other programs that the FAA has under way.

And, Mr. Chairman, as you will recognize when we talk about the research and development budget, we're talking about a very small percentage of the total FAA funding needs. And, clearly, a few million dollars can be made available from the Aviation Trust Fund.

So in closing, Mr. Chairman, clearly it's our view that a national transportation policy which lays out a strategic course for the future, in addition to establishing well focused research and development programs and goals and objectives, is the real solution to many of our programs.

Without a national transportation policy, AOPA doubts that we'll ever solve many of these airport priority crisis and constraint problems, nor will we probably ever develop sufficient capacity and capability in the air traffic system.

For that reason, we are, as you well know, pressing the development of a national transportation policy and are very supportive of the administration on that point.

But specifically to the research and development budget, it's clear that we need to close the gap between past appropriations levels and the authorized levels, there are clearly some 20 to 30 million dollars' worth of additional programs that should be implemented that we need critically to satisfy the long-term needs in our aviation system.

I have just three final recommendations specifically that I believe in the area of FAA management will improve administration of the RE&D program. And that's simply that in analyzing their proposal for this year, we've identified a number of overlapping areas of focus—those clearly from a management perspective should be consolidated and made more efficient.

Secondly, we believe that the FAA could accomplish a great deal by contracting out to private sector entities and to universities where the talent and capability exists to develop products and deliver them much more efficiently than the Federal Government can in many cases.

And, lastly, we believe that FAA should increase and strengthen their simulation and modeling capabilities to test their products long before they are deployed. Unfortunately, in many areas in the NAS program their much advertised products, when they're finally deployed, will not meet the real world demands and don't live up to expectations and the benefits that we were led to believe might exist.

And because of what you heard so much of in just the past few minutes on the MLS program, I'll have to tell you that from our perspective that's true—the MLS program. And time will tell whether in fact they'll ever develop the benefits as they've advertised.

So in short, Mr. Chairman, I appreciate the time, the few minutes, to comment on their program, and appreciate any questions you might have to further develop our position. Thank you.

[The prepared statement of Mr. Brown follows:]

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Statement of Steven J. Brown
Vice President
Aircraft Owners & Pilots Association

Committee on Science, Space, and Technology
Subcommittee on Transportation Aviation and Materials
Honorable Tim Valentine, Chairman
U.S. House of Representatives

Regarding Fiscal Year 1990
Federal Aviation Administration RE&D Plans
April 11, 1989

Mr. Chairman, I am Steve Brown, Vice President for Government and Technical Affairs of the Aircraft Owners and Pilots Association (AOPA). Our association represents the national aviation interests of 285,000 individuals who fly general aviation aircraft for personal and business transportation. According to the most recent FAA information, AOPA represents 40 percent of the total U.S. pilot population and 60 percent of the "active" pilots. Mr. Chairman, general aviation is a true cross-section of the aviation community and, as the operator of 98 percent of all registered civil aircraft, is a major beneficiary of safety improvements and well-focused research programs. We are committed to achieving the safest possible airspace system with capacity and access for all users. We also believe the system must be designed and based on the legitimate needs of the user and not for the mere convenience of FAA managers operating the system.

AOPA's analysis of FAA's recently developed near- and long-term research plans indicates that the broad initiatives are well targeted and are supported by a carefully considered set of strategic objectives. However, we believe many programs could be pursued more efficiently and that, in selected areas, there is a shortage of funding. While the resources to continue many ongoing programs are sufficient, the apparent gap in funding that will result from any decrease in appropriated funds from the authorized levels will, in our judgment, seriously impare FAA's ability to deliver critical future technologies in time to meet accelerating national capacity demands.

As an example, it is abundantly clear to everyone in the industry that our nation's airports infrastructure must be expanded to serve increasing demand. However, absent a clear federal policy on airport capacity development, it is unrealistic to believe that local communities will take the individual, complementary, collective action, to fund and implement an integrated system of national airports serving our national transportation needs. The national transportation systems that preceded aviation; the railroad, canals, and interstate highway systems were not and could not have been built with such an arcane policy. Clearly, a national airport system efficiently linking major metropolitan areas, both to themselves and to outlying, less populated communities, certainly will not be either. If this Administration and this Congressional Subcommittee under new leadership are unable to develop a National Transportation Policy that successfully addresses airport capacity development, millions of U.S. citizens will be faced with de facto "second class citizenship."

To the average citizen, aviation transportation disenfranchisement is in direct conflict with the stated social and political objectives contained in deregulation of commercial air transportation. For the aviation user, the lack of a federal policy which strategically develops technology and solutions to our current as well as future airport and air traffic capacity constraints results in more than "second class citizenship." If FAA's RE&D plans cannot develop and deliver on time solutions which have real, near-term results, our national aviation system will continue to deteriorate under the rationing and constraint implicit in daily and hourly tactical decision making. This has a direct, negative impact on our nation's economy and serves to supress efficient economic development of our nation's commerce.

RESEARCH, ENGINEERING AND DEVELOPMENT (RE&D) PLAN

During an era when the technology challenges facing FAA are accelerating and the stakes for the deployment of technology are at their peak, the Administration has requested $165 million in RE&D funds compared to a Congressionally authorized level of $222 million. With its request, the Administration is essentially abdicating its full responsibilities to develop prototype navigation, weather, noise reduction and capacity technologies. Of the requested funds, ATC- and TCAS-related RE&D represent 68 percent of the expenditures, leaving only 32 percent for equally critical capacity enhancement needs.

An appendix to this statement contains a set of specific program level recommendations. The following comments outline our position and recommendations on the major RE&D areas of priority.

Weather Programs

Deterioration of weather services continues in spite of FAA RE&D and NAS Plan (NASP) objectives designed to improve weather services, products, and availability. Disregarding specific Congressional guidance, the FAA has reduced weather information outlets, such as flight service stations and the industry faces similar reductions in NWS services.

In the U.S., weather has been cited as a cause or primary factor in four of every ten fatal accidents and two of every ten non-fatal accidents in general aviation for a number of years. The aviation accident rate could be substantially improved if accurate forecast and timely weather information were more readily available for both preflight planning and inflight decisions.

In addition to these safety considerations, weather is the single largest contributor to delays, comprising nearly 60 percent of all delays in the ATC system. This committee must focus priority on the continued systematic erosion of weather services for all aviation users and FAA's failure to develop and deploy on a timely basis the available new technologies. From a safety perspective, this is the most devastating deficiency in the National Airspace System.

Unfortunately, we have not seen FAA or NWS develop (either independently or cooperatively) an integrated network of weather services, nor do we see that either agency has a clear directive supported by single-minded dedication to the mission.

Users have been guaranteed "equal or better" service for years, but the FAA has redefined the level of "equal" to a standard way below thresholds previously accepted by industry, and as a result there is reduced user confidence in these vital weather programs--so much so that users are at the point where any change in the system is sometimes considered better than the poor service previously provided. In the past year, the FAA and NWS have proposed or reduced the integrity of over 100 aviation weather facilities.

These examples are demonstrative of the ongoing battle between FAA and NWS on the issue of aviation weather. The FAA's philosophy of late has been, "We're getting out of the weather business," while the NWS philosophy is, "We're not in the specialized business of aviation weather." It's about time for these two organizations to agree upon a mission and work together with input from users to achieve common objectives that enhance aviation safety. We believe, FAA should clearly take the lead in aviation.

Navigation

Perhaps the greatest long-term research needs are for future systems definition. Satellite systems promise great improvements for all forms of aviation in terms of communication, navigation and surveillance. Recent U.S. and international efforts have clearly identified these benefits and developed conceptual plans for implementing these systems. Much work must be done in basic research to bring these concepts to maturity, yet apparently only 2 percent of the RE&D budget has been allocated to this essential activity.

For some time we have been concerned that the FAA has not examined the rapidly approaching satellite revolution in aviation. However, within the past two years, the international community has made quite clear its intention to proceed rapidly with satellite technology for aviation, so we must rapidly address this issue if we are to gain the maximum benefit from the technology. More importantly, the interaction between satellite systems and the existing NASP programs must be carefully examined to ensure that NAS Plan programs are not overcome by superior technology.

Other Programs

Many other areas of RE&D have not received sufficient attention or funding in the upcoming budget. These include:

- o GPS/Loran C integration for sole navigation;
- o Low-altitude communications and surveillance needs to include service to both VFR and IFR users;
- o Icing Forecast Model;
- o Automated traffic management systems such as AERA-3;
- o Airport surface traffic surveillance and conflict alert;
- o Airport surface safety projects; and
- o Simulation study of Hubbing Impacts on Capacity.

In all, we feel that the Administration has underfunded the RE&D budget by at least $25 million and perhaps by as much as $55 million. We urge you to task the Administration with providing a more aggressive and realistic FAA RE&D program for the future.

As users, we believe additional funding should not be a problem since all RE&D programs are funded wholly from the Aviation Trust Fund (ATF), which at the end of FY 1988 had an accumulated balance of almost $11 billion. Since this fund is entirely user-funded and the money is "on deposit," it should be used to their benefit by providing adequate RE&D.

National Aviation Policy

The causes of today's problems stem primarily from the lack of a coherent national aviation policy. That is what the DOT should have been developing in partnership with FAA over the last 20 years, and most particularly since 1976. Yet today we

still lack a blueprint for aviation similar to the policy initiatives in the 1950s that led to development of the interstate highway system. Since the advent of deregulation in 1978, the nation has needed more than ever before a national plan for the future. Clearly, AOPA is strongly supportive of Secretary Skinner's insistence on developing a national transportation policy which should remedy many of our past policy and leadership problems.

Aviation must rejoin the ranks of progressive national transportation systems and experience a rejuvenated commitment to capacity and safety. A national aviation policy, coupled with leadership from the Administration and Congress, can redirect our air transportation system and transform it from a source of ridicule and embarrassment to an example of economic progressiveness with a commitment to full access and equality for all participants.

AOPA believes the time has come to set our sights on the future and chart a clear course for aviation in the United States. The national economic lifeblood depends on aviation in all its forms. Our national transportation policy must finally be recognized and raised to the level of national debate on its overall merit.

SUMMARY

Our national airspace is suffering from capacity constraints, inadequate service and periods of denied access to all users. The nation's pride in a once-unparalleled level of transportation efficiency has severely eroded. We believe the solution to our problems will only be found when we as a nation debate and establish a national aviation policy that permits us to reference all our priority decisions against established goals and objectives. Our current set of cyclical, ad hoc, tactical decision making has not produced a system any of us believe is adequate.

The Administration's RE&D request has bright spots, but is in need of adjusted priorities and increased funding to ensure an adequate technology foundation that can meet future demand.

Overall, we believe FAA's RE&D plans can be made more efficient by adopting three simple management initiatives. Our review of the plan revealed a number of programs that appear to have overlapping areas of focus. In part, this may be caused by the location of research personnel but any overlap should be eliminated by better program management. Second, more of FAA's mission could be accomplished with contracts to private sector entities as well as with universities where innovation is accomplished more quickly and efficiently. Finally, we

strongly recommend increased use of FAA simulation studies and modeling to test RE&D products before they are deployed. In the past, FAA's reluctance to fully test developed products has led to controversy when much advertised products have failed to meet real-world demands.

We have outlined the areas that need critical attention by the Subcommittee and hope you will closely scrutinize FAA's progress on the rebuilding of our national aviation infrastructure.

Appendix

Weather Radar

There is no doubt that advanced weather radar will improve airspace system safety and provide enhanced significant weather information to system users. It will detect weather hazards such as wind and gust fronts, turbulence, mesocyclones, tornadoes, and icing conditions. However, this program needs more emphasis and final proof of its wide-ranging benefits.

The Low-Level Wind Shear Advisory System (LLWAS) has demonstrated limitations. Enhancement will not permit it to satisfy the wind shear/microburst need. We should not let the FAA commit "good money after bad" for additional research and enhancement of LLWAS.

Other Programs

System capacity problems have reach the critical point for many of our major metropolitan areas. Yet only a fraction of the RE&D budget is earmarked for capacity improvement and delay reduction. Research requirements for converging and parallel instrument approaches, improved terminal sensors, and reduced longitudinal separation have been recognized for years as areas where real capacity gains may be realized.

Human factors research has historically been a poor stepchild of FAA research efforts. In the past, most of this effort has been handed over to the National Aeronautics and Space Administration, but their efforts were not focused adequately in real-world aviation needs, particularly in general aviation. Cockpit displays, operational efficiency, training methods and pilots stress are areas where safety and efficiency gains can be made, and we hope FAA's recent appointment of a Human Factors "czar" will bring central control and priority to the agencies efforts.

FY 90 FAA BUDGET ANALYSIS

HUMAN SYSTEMS AND OPERATIONS (Title 26)

Program Description -- Statistics indicate that 65% of aviation accidents are due to flight crew error. Human factors systems and operations have become significant areas of focus due to advanced and more complex technologies creating large increases in the amount of data available to flight crews. This program involves research and development of human factors considerations with emphasis on system design and certification and flight crew and controller certification and training. Development of simulation systems is a significant part of this program.

AOPA Position - AOPA supports research leading to efficiencies, modernization and human factors considerations in the development of cockpit displays, data entry, training standards, automated ATC systems and related procedural modifications. FAA's need to reinvent the wheel in these areas is questionable, however, since private industry, universities, airlines and other entities have ongoing research and development programs in these disciplines.

R/E/D Budget Request -- $10,592,000

Breakdown -		
	Information Transfer and Management	$ 914,000
	Causal Factors in Accidents and Incidents	905,000
	Human Factors and Regulatory Support	500,000
	Control and Display Technology	810,000
	Flight Crew Certification and Training	3,040,000
	Aircraft Automation	730,000
	Human Performance Assessment and Improvement	930,000
	Flight Deck Certification Criteria	$ 340,000
	Flight Crew Systems and Operations	$8,169,000
	Controller Human Factors	780,000
	Expert Systems Applications to ATC	1,643,000
	Controller Systems and Operations	$2,423,000

FY 90 FAA BUDGET ANALYSIS

DYNAMIC SPECIAL USE AIRSPACE -- ATC AUTOMATION (Title 24)

Program Description -- The management of special-use airspace became a major issue in 1988 due to the GAO report and subsequent Congressional mandate requiring FAA and DOD study the issue. The mandate requires FAA/DOD coordination of SUA by looking at present and future needs. Further, FAA is to assure efficient utilization of SUA, reduce and/or modify current SUA and establish policies and guidelines for its proper coordination and establishment.

AOPA Position -- AOPA supports the GAO report and the congressional mandate. We believe that present and future SUA requirements must assure efficient utilization, a need for its establishment, and adequate FAA/DOD coordination. AOPA believes that a significant reduction in SUA is achievable; that remaining SUA can be better utilized for its mission purpose; that real-time activity reporting in the airspace can be better managed; and that the controlling agency frequencies must be charted. Further, we seek one controlling agency in several large geographic areas throughout the country to coordinate air traffic in the area.

R/E/D Budget Request -- $466,000.

AOPA Recommendation - The funds appropriated in this area are ample and will assure the completion of FAA's study of SUA. The report is due to congress in FY 1990 and will provide recommendations, procedures, etc. for the proper utilization of SUA. DOD has begun implementation of their program entitled, Military Airspace Management System (MAMS). This plan has already established ATC and/or controlling functions in three areas of the country with four more planned. DOD and FAA have budgeted for these functions and their implementation.

AOPA Recommended Budget Adjustment -- None.

FY 90 FAA BUDGET ANALYSIS

THE FOLLOWING ARE ADDITIONAL AIRSPACE/AVIATION STANDARDS PROGRAMS INVOLVING FY 90 FAA BUDGET REQUESTS

SATELLITE APPLICATIONS (Technology - 16)

Program Description -- This program involves the development of satellite technology to enhance the intergration of the Global Positioning System (GPS) and LORAN C into a stand alone, sole means of navigation. Satellite applications will extend to communications used by the civil aviation community. Communications will be enhanced by the development of digital voice and data link.

AOPA Position -- AOPA supports this effort. We are participating on several levels with the establishment of GPS/LORAN as an integral part of the navigation system both nationally and internationally.

R/E/D Request -- $3,818,000

AOPA Position -- AOPA recommends that this program be increased a minimum of $7 million in the FY 90 budget request. According to estimates, there is a need for approximately $23 million dollars over the next three years for the U.S. to realize the value of this integrated navigation and communication system. This increase will provide for:

Preparation of a manual or doctrine -	$1.0 M
Preparation and publication of a Federal Strategic Plan for implementation -	$0.5 M
Preparation and execution of a training program for all ATC and management personnel -	$5.0 M
Preparation and distribution of appropriate manuals, notices, charts, etc.	$0.5 M
	$7.0 M

AOPA Recommended Budget Adjustment -- Increase by $7 million.

FY 90 FAA BUDGET ANALYSIS

NAVIGATION (Title 04)

Program Description -- This is a subprogram of the Navigation Systems Engineering program which is evaluating GPS and LORAN as enhancements to current systems. GPS and LORAN are considered supplemental navigations systems. This program is designed to mate the two systems which will provide the integrity necessary to establish GPS/LORAN as a stand alone, sole means of navigation.

AOPA Position -- AOPA supports this effort. We are participating on several levels involved with the establishment of GPS/LORAN as an integral part of the navigation system both nationally and internationally.

R/E/D Budget Request -- $2,920,000.

Breakdown -	GPS Utilization	$1,099,000
	Navigation Systems Engineering	1,361,000
	Navigation Systems Development	460,000

AOPA Recommendation - The deployment of the LORAN/GPS navigation system and implementation of related enroute, terminal and approach procedures is at a stage requiring additional funding. The first 500 approaches are tentatively scheduled for implementation in late 1990 or early 1991. However, funds for necessary equipment to realize this schedule remain unbudgeted.

Major projects within this program were funded in FY 87 and 88: LORAN C Mid-Continent transmitters and the GPS satellites (to be a total of 24).

Other areas requiring FY 1990 funding are:

Communications Interface Unit	$1.20 M
Synchronization of LORAN C Master Station Transmitter Timers	1.00 M
Control Strategies concerning LORAN C Secondary Transmitters	0.25 M
LORAN C Interoperability Investigation	0.50 M

Surveys to provide reference data masters and runway end data for LORAN C approaches	0.75 M
Implementation of "Aviation Blink" and Aviation Standard O&M practices at LORAN stations	2.00 M
Total	$5.70 M

FAA is insisting that 212 aviation monitors must be located at VORTAC facilities to assure the integrity of the overall LORAN system. These units would require an additional budget requirement of $4.8 M. Participants of the LORAN C Implementation Committee, AOPA and others are attempting to convince FAA that these monitors are not needed.

Over the next three years an estimated $23 million more will be needed for implementation of LORAN/GPS timing, calibration, upgrades and O&M practices at LORAN stations.

Other budget estimates pertinent to this program are included in program title 16 - Satellite Applications. A combination of these two budget areas should be considered.

AOPA Recommended Budget Adjustment -- Increase by $5.7 million.

Mr. VALENTINE. Thank you, Mr. Brown.

Mr. O'Brien?

Mr. O'BRIEN. Mr. Chairman, I am John O'Brien, Director of the Engineering and Air Safety Department for the Air Line Pilots Association. ALPA represents 41,000 professional pilots who fly for 41—47—airlines in this country.

We appreciate the opportunity to appear here—appear before you today to add our voice to the voice of other members of the aviation community in strong support for the need of an aggressive research, engineering, and development program within the FAA.

Our statement submitted for the record contains several programs that we feel are in need of special attention. However, as suggested, Mr. Chairman, in the interest of time I'll present a brief summary of a few of the R&D projects we—we feel deserve special attention.

In no order of priority, first the TCAS—collision avoidance system. We feel that the present proposed operational evaluation that will be part of the implementation program—FAA's implementation program—is something that should be supported by all members of the industry and the FAA; and if required, Congress should provide additional funding for the FAA so that this evaluation program can be undertaken in a structured manner and will produce some viable results.

We also feel that the continued development of TCAS III is a necessity.

Transition to a Microwave Landing System, I would agree with the earlier comments we heard spoken by Mr. Poritzky. However, there is need for examination of several elements in the program that hadn't been adequately researched up to this point, and that is a need for displays where complex multi-segment approaches that will be flown by pilots; the question of back azimuth with missed approach; the location of antennas on large airplanes, and the FAA criteria for obstacle clearance and obstruction planes for complex procedures that would be involved with MLS approaches.

Runway friction measurement. As a result of some special interest on our part, the FAA undertook a joint program with NASA to look at runway friction measurement as far as maintenance purposes were concerned and operational purposes.

We feel that to date valuable information has been produced by this operation with regard to maintenance for airports. However, from an operational perspective, we have a long way to go before results are available that will help us from an operational perspective, that is, give pilots information needed with regard to operations on slip or contaminated runways—slippery or contaminated runways.

To date, we have shown some promising results in regard to correlation between friction measurement vehicles and narrow body airplanes. However, we need to look at wide bodies or larger airplanes and see if these correlation results will continue.

In the area of airborne wind shear detection devices, there is an FAA rule out now that requires detection devices on all aircraft. However, we feel that the rule does not specify the cockpit devices really needed, that is, a predictive device, and until the current FAA/NASA program going on down at Langley is completed and

hopefully produces a predictive device—one that would look ahead of the airplane and warn the pilot of the presence of wind shear and be able to take action before you get into it, then we will not have a piece of equipment that will adequately satisfy our safety needs.

There are several other programs that could be mentioned, but again in the interest of time, I'd just like to mention that many of the programs listed in our submitted statement are either jointly under way with NASA or will require the special expertise and facilities available only through that organization.

There are many advantages to joint interagency agreements. In addition to not having to duplicate personnel and equipment, NASA serves as a third party to the FAA and industry, and can provide a specialized, unbiased view.

This usually results in the consideration of technical and scientific aspects as well as operating requirements for a product. The Association fully supports this method of problem-solving and commends the subcommittee for promoting and supporting these kind of interagency agreements.

In summary, Mr. Chairman, the FAA's plan for research, engineering, and development has never been more important in the view of the current status and future growth expectations of the aviation industry.

Congress has in the past and we hope will continue in the future to provide the necessary guidance and funds to carry out these programs. We have pointed out several areas in our statement where we feel special consideration should be given so that the national airspace system can operate as safely and as efficiently as possible.

Thank you, Mr. Chairman.

[The prepared statement of Mr. O'Brien follows:]

STATEMENT OF

JOHN O'BRIEN

DIRECTOR ENGINEERING AND AIR SAFETY DEPARTMENT

AIR LINE PILOTS ASSOCIATION

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS

COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

U. S. HOUSE OF REPRESENTATIVES

APRIL 11, 1989

FEDERAL AVIATION ADMINISTRATION

RESEARCH, ENGINEERING AND DEVELOPMENT PROGRAM

Mr. Chairman and members of the subcommittee, I am John O'Brien, Director of the Engineering and Air Safety Department of the Air Line Pilots Association (ALPA). ALPA represents 41,000 professional pilots who fly for 47 commercial airlines. ALPA appreciates this opportunity to appear before you today to add the voice of our membership to others from the aviation community in strong support of the FAA's Research, Engineering and Development (R,E&D) Program.

At the outset, I want to especially commend you, Mr. Chairman, for your leadership in Congress on aviation issues. Your concern over adequate funding of necessary research and development is clear evidence that you and your subcommittee place the highest priority on critical aviation programs. We all agree that continued research and development in aviation is essential to sustain the operational capability of our air transportation system, provide the improvements necessary to meet additional airport capacity requirements, and provide necessary safety improvements to the nation's air transportation system.

For a number of reasons, the FAA has not been provided with sufficient resources necessary to carry out its basic safety mandate. The inadequate funding has forced the FAA to establish program priorities that we believe have not in all cases been in the best public interest from a safety standpoint. Therefore, we welcome the opportunity to present our comments on those programs which we feel are in need of continued congressional support.

The majority of today's safety or modernization programs will extend over a period of five or ten years or even longer. This is due to the revolution in technology which has produced a complex and extremely sophisticated number of systems to contend with in any large development program. In most cases, a program of five years' duration is a short-term program. In order to be successful, the FAA must have a sound funding base to provide the necessary resources (personnel, facilities, and equipment) to complete a program on time. Time is important since we are dealing with safety. Time is also important because, in most cases, costs increase with time delays.

The following is a list of research and development programs, projects, or activities which need either funding, direction, legislation, or some combination thereof. Since these programs are all safety related, they should be given special consideration.

TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEMS (TCAS)

As you are aware, Mr. Chairman, the FAA and aviation industry over the last eight years has actively been in the process of developing an independent airborne collision avoidance system. This system called TCAS, has several versions, one of which (TCAS II) has been tested in a limited implementation program on Piedmont, United and Northwest airlines aircraft. This is a milestone, and we applaud the accomplishments of the people involved in bringing this system to this point of development.

We cannot, however, endorse the present version of TCAS II as an end product. In our opinion, the TCAS II operational deficiencies which include excessive false alarms and vertical-only escape maneuvers eliminate it as a candidate for the air carrier collision avoidance standard. However, we did reluctantly agree with the Congressional legislated mandate which requires TCAS II for all air carrier aircraft by 1991. This agreement was based on a choice of having some collision avoidance protection even though it did not meet our operational requirements, or no protection at all. Recently, the airlines have come to recognize that TCAS II

does have shortcomings and have insisted on an operational evaluation of TCAS as the Congressionally mandated implementation program continues. We support this operational evaluation because we feel that it will verify our concerns with TCAS II and move the industry toward a TCAS III decision. This evaluation program is not part of the original TCAS development program, therefore, additional funds will have to be allocated for this purpose.

I am sure, Mr. Chairman, you are aware that the FAA and industry has also been working on the development of a TCAS III. As a matter of fact, this system, which was installed on FAA Technical Center aircraft, has undergone a significant number of hours of flight testing with excellent results. While its full development and certification may be behind TCAS II, we are confident that if the FAA affords the proper priority and leadership, the TCAS III could be ready for operational testing before the end of 1990.

We strongly urge Congress to provide the funding necessary to complete an operational evaluation of TCAS II during the implementation of this system by the airlines and the funding necessary for the certification of the TCAS III system and direct the FAA to use it for that purpose.

TRANSITION TO THE MICROWAVE LANDING SYSTEM (MLS)

ALPA policy calls for precision approach systems to be installed on each runway end used by air carrier aircraft because precision approach procedures are inherently safer than nonprecision approaches. Therefore, we support the installation of straight-in MLS approach procedures where ILS cannot be installed. We also support prompt installation of ILS systems where they can be installed. Our position has long been that there should be a precision approach to every runway used by air carrier aircraft. We are concerned that many runways identified for a precision system will have to wait several year for an MLS.

The flexibility of the MLS, especially regarding siting, makes it possible to have a precision approach to runways where an ILS is not feasible. Also, the FAA has revised its Airway Planning Standard Number One to include MLS qualifying criteria that will permit MLS selection for runways that could not have qualified using the present ILS criteria.

Because of its direct relation to safety, the ILS and MLS programs should not be subjected to any budget reduction that would delay the availability and installation of

precision approach guidance for additional runways.

The success of the MLS implementation depends greatly on the will of the users to purchase MLS receivers. Implementation will be seriously handicapped if the FAA proceeds with its plan to collocate the MLS with ILS systems. Congress should direct the FAA to ensure that, in the near term, MLS systems be installed primarily on runways that will increases airport capacity or on runways that do not now have a precision approach system.

Additional research and development is required for the MLS program. The FAA has yet to determine how and when the MLS receiver will transition from the front azimuth signal to the back azimuth signal during missed approach procedures and how the appropriate (back or front) azimuth will be selected for departures.

Also, cockpit displays for complex MLS/RNAV segmented and curved approaches have yet to be developed, and the necessary displays for pilot situation awareness have not as yet been identified. In addition, there is a need to research and test the multiple MLS antenna locations that will be needed for large aircraft.

In the area of MLS and MLS/RNAV instrument approach procedures development, a substantial amount of research and testing still must be done to develop the required obstacle clearance areas for the various segments and maneuvers.

COCKPIT DISPLAY OF TRAFFIC INFORMATION

ALPA is concerned about the potential role of the Cockpit Display of Traffic Information of Airborne Situation Display (ASD) in the new ATC system. We feel the merits of such a system have been obscured because of exaggerated claims made both by some of its proponents and by those with interests in competing alternatives. These conflicting claims have prevented a positive approach toward developing the concept into a working reality. The original NASP at least briefly addressed the possible merits of ASD, but the current version does not contain any reference to such a system at all.

The tests of the ASD to date by the FAA and NASA have shown to everyone's satisfaction that substantial capacity gains may be achieved through pilot-controlled spacing on in-trail arrivals and departures using common paths. We recommend that ASD be reinstated as an active R,E&D program.

FAA SECURITY PROGRAM

Although some airports already have elaborate systems for searching passengers and luggage to minimize the chances of a hijacking or bombing, these incidents still occur and terrorism is continuing to spread worldwide. Recent terrorist activities have emphasized that our security systems are still vulnerable.

To counter this threat, we must continue the FAA security program and make improvements. As the terrorists increase their knowledge, techniques, and sophistication, we need to update and improve our security efforts. Since terrorists continue to modify both the packaging and types of weapons and explosives they use, there is a continuing need to develop new technology that will detect these threat sources. Furthermore, there is a need to increase the number of security inspectors and to purchase additional and more sophisticated detection systems as they become available. It is estimated that at least $10 million is necessary for this addition.

AIRPORT SURFACE DETECTION RADAR (ASDE)

The problem of "close encounters of the wrong kind" on airport surfaces is one growing in magnitude. One need only examine the accident and incident reports for the past ten years to see the continuous increase in events involving either two aircraft or an aircraft and vehicle. The worst collision in aviation history occurred on the ground between two B-747 air carriers at Tenerife. The increasing number of unauthorized runway incursions should be a signal that this matter needs attention before even more disasters occur. Currently the only tool air traffic controllers have available at a limited number of airports to deal with this problem is an antiquated, unreliable radar system that, from what we have been told, is virtually worthless. The FAA has, for the last decade at least, been in the process of developing and procuring a new-generation surface detection radar (ASDE III) that would provide controllers the display they need to ensure adequate separation between aircraft during periods of poor visibility. Needless to say, this has not been one of the better managed FAA programs!

We understand that 30 of these new systems have been procured and initial installation is about to begin. We welcome this action and hope they will be installed and operational so as to keep pace with the tremendous growth of traffic activity at our major airports. But perhaps we should not stop with the procurement of these units. The

American taxpayer has expended an enormous amount of money for the development of this new technology. Can this technology be adapted for use on airport surfaces to address more specifically the runway incursion problem mentioned earlier? The safety implications would be interesting to explore, and we feel sure there are American manufacturers out there who would be delighted to provide both the FAA and members of your subcommittee information on their equipment capabilities. We believe this is a concept that the FAA should actively pursue through an active R,E&D program. We would also hope your subcommittee would find it equally interesting.

RUNWAY FRICTION MEASUREMENT

At the present time, a pilot landing or taking off on a runway contaminated with snow, ice, or slush must rely primarily on other pilot reports as to the condition of that runway and the ability to stop on that runway. These pilot braking action reports are very subjective due to differences between the reporting aircraft -- lighter/heavier, faster/slower, etc. -- and different pilot interpretations of the same set of circumstances. There have been many instances in which aircraft went off runways because the flight crew had inadequate information on the stopping condition of the runway. Therefore, there is a need to determine if the presently available friction measurement vehicles are sufficiently accurate under winter contaminated conditions to be used to give runway friction measurement information to a flight crew. These vehicles have proven themselves to be very useful to the FAA and an airport operator in ensuring that the runway is maintained to a satisfactory dry/wet level of friction. We must now expand this knowledge to determine the vehicles' reliability under winter conditions. Thanks to a joint FAA/NASA research and development program, this task is approximately fifty percent complete. However, the project has only involved the ground vehicles and large narrow body transport aircraft; wide body aircraft have not been included in the R&D project. Therefore, Congress should earmark $500,000 to be spent each year, for the next three years, on the joint FAA/NASA program. This funding level will allow completion of the work already started, comparing the ground vehicle readings to large narrow body aircraft, and permit expansion of this program to include wide body aircraft.

CABIN SAFETY

The topic of air carrier cabin safety encompasses a very large range of items and includes carry-on baggage, interior

crashworthiness, and interior fire resistance. We recognize and congratulate both the FAA and industry for the amount of R,E&D already completed in this area. However, to a great extent, this R,E&D has only proven how little we now know about cabin interior smoke, fire, and toxicity, and indicates an obvious need to continue testing. Furthermore, as aircraft manufacturers and airlines continue to add fuel tanks in previously sterile areas such as cargo compartments and tail planes, we must guarantee that this additional fuel will not turn the passenger cabin into an inferno. Past research efforts into anti-misting fuel must therefore continue into fuel tank design such as self-sealing tanks and breakaway self-sealing fittings. All of these items affect passenger safety and the ability to survive an inflight fire or accident.

HUMAN PERFORMANCE RESEARCH

In order to help ensure the safety in our nation's aviation system, it is important to understand areas where human shortcomings may lead to problems, incidents, or accidents. The FAA is attempting to address these issues through selection, hiring, and operational practices for its employees. Pilots are the other half of the important safety equation.

The FAA published a Cockpit Human Factors Research Plan in January 1985 that is designed to investigate and improve the human interface with an automated air traffic control system and highly automated new aircraft. The FAA began to address several operational safety issues identified by this plan, with more to be studied at a later date. The original funding levels for this important research program were expected to be $1.65 million in fiscal year 1985, $4.3 million in fiscal year 1986, and $3.4 million in fiscal year 1987. Actual funding levels were a small fraction of these original projections.

That original plan has become a part of a National Plan to Enhance Aviation Safety through Human Factors Improvements which was developed through the cooperative efforts of the FAA, NASA, and Industry. We feel this National Human Factors Plan identifies essential human factors research which will provide important immediate operational safety gains and should be undertaken at the earliest opportunity. In this regard, the FAA funding request for human factors research should be supported and immediately granted. We note that the FAA has established a Human Factors Coordinating Committee to provide guidance and direction from the highest levels for human factors research

requirements and activities. We are confident that allocated money will be appropriately applied in these critical areas.

AIRBORNE DETECTION AND DISSEMINATION

While ground detection of windshear or microbursts is essential, airborne detection may not be overlooked. A recent final rule publication amended Part 121 to require airborne low-altitude windshear warning and flight guidance equipment in airplanes by 1991, and the FAA is certifying airborne devices that could help us reduce future microburst accidents. However, ALPA cautions that the FAA must aggressively encourage continued research and development of reactive airborne warning devices, and require manufacturers to demonstrate an appropriately low false alarm rate and high probability of detection, prior to certification of new equipment.

The FAA and NASA have been pursuing a joint program to develop forward-looking predictive windshear warning systems that can detect a microburst prior to entering it. That program should continue without delay.

AIRPORT RESEARCH AND DEVELOPMENT NEEDS

We urge this subcommittee and Congress to give immediate attention to the R,E&D funding needs for airport capacity enhancement. The testimony provided by Mr. Reilly of the Industry Task Force on Airport Capacity Improvement and Delay Reduction identifies many R,E&D projects which are essential for short- and long-term capacity improvements. It is critically important that funding be provided for those projects in order to ensure that airport capacity keeps pace with airspace capacity.

As I have said, the prevention of runway incursions requires additional research and development. Both NASA and the NTSB have identified the need for improved visual aids such as signs and taxiway lighting systems to help prevent runway incursions and allow safe operations in low-visibility conditions. Visual glidepath guidance is also an essential ingredient for safety operations during construction projects involving threshold displacement. There is currently no means to provide such guidance information. A means needs to be developed for effective temporary visual and electronic vertical guidance systems. Additionally, there is a need to develop effective lighting and marking of airport surfaces specifically for use during construction projects.

Many of the programs listed above are either jointly under way with NASA or will require the special expertise and facilities available only through that organization. There are many advantages of joint interagency agreements besides not having to duplicate personnel and equipment. NASA serves as a third party to the FAA and industry, and can provide a specialized, unbiased view. This usually results in the consideration of the technical and scientific aspects as well as the operating requirements for a product. The association fully supports this method of problem solving and commends the subcommittee for promoting and supporting these agreements.

In summary, Mr. Chairman, the FAA's plan for research, engineering, and development has never been more important in view of the current status and future growth expectations of the aviation industry. Congress has in the past and will in the future be asked to provide the necessary guidance and funds to carry out these programs. We have pointed out several areas where we feel special consideration should be given so that the national airspace system can operate as safely and efficiently as possible.

Mr. VALENTINE. Thank you, Mr. O'Brien—thank all of you. ALPA, Mr. O'Brien—ALPA seems to be—endorsing the full utilization of both M—MLS and ILS systems in the—in the aviation system to include the possibility that both systems might be at a—a single airport with different systems serving different runways. Would that present any problem looking at the human factors situation?

Mr. O'BRIEN. Well, first, Mr. Chairman, we have an Association goal that would see a precision approach aid on the end of every runway served by air carrier airplanes. And whether that's an ILS or an MLS, we feel that would be better than a—than a non-precision approach from a safety and operational vantage and efficiency perspective.

With regard specifically to your question, we feel that there would be absolutely no problem with having MLS's and ILS's located at the same airport. For as we view the MLS system, the presentation of information in the cockpit to the pilot would be absolutely no different; the pilot would not know whether he was operating on ILS or an MLS as far as flying the airplane was concerned.

Mr. VALENTINE. We are particularly interested in—in your comments, Mr. O'Brien, on the question of problems—real or imaginary—with respect to the runway—runway incursion problem.

Tell us what you think about that. Have you had personally any narrow escapes?

Mr. O'BRIEN. I'm lucky to say that I have not had personally any narrow escapes. Knock on wood.

However, we do feel that the runway incursion problem is a very real problem. It's—it's not an imaginary problem. We feel that this is borne out by some accidents and incidents we have seen occur in the past.

We also feel that the true magnitude of the problem may not be presented in the FAA's statistical presentation of information. There are other data bases which some people will argue to the validity, but the NASA/ASRS data base, for example, contains many more reports of runway incursions than are statistically provided by the FAA.

In addition to that, we are of the opinion that there are probably other incidents that are occurring that probably are not even reported to NASA.

So it's hard to get a—a factual presentation of really the magnitude of the problem. However, we feel that it is a significant problem; and as indicated in our statement, we feel that there are other avenues that must be explored other than what is currently being explored by the FAA in order to satisfactorily address the problem.

Mr. VALENTINE. I think that we, all of us, perhaps look at technology to solve our problems, especially in the area that we're talking about: aviation.

But do you have an opinion which you would care to share with us as to whether or not there are certain things that the FAA could require, such as better—better markings and signs, and mechanically operated stop-and-go signals, and things of that kind? Perhaps more people on the ground directing traffic.

Mr. O'BRIEN. Yes, sir, all of those things are very important as far as ingredients to solving the problem. There's two ways to look

at the problem. You look at present procedures, techniques and devices that are intended to control traffic today: personnel, procedures, hardware. And you look at where those present systems or procedures have failed with respect to incidents and accidents that have already occurred, and then you build or change on that experience.

And actually there's two efforts that are going on under way today. There are changes to procedures—you heard earlier in earlier testimony by the NTSB that changes to procedures have been developed. We have indicated were additional personnel, more experienced personnel are required. The FAA has R&D efforts under way to look at new techniques in order to control traffic in a better way.

Also, there is another way to look at the problem, too, and that is once in a—runway incursion occurs, is there a way of detecting that and getting information rapidly, either to the controller or to the pilot, in order to do something and take some action.

That's a system of last resort, you might say. We would like to see more emphasis placed, though, on preventing the runway incursion from actually occurring rather than detecting it after it has occurred and trying to solve the problem of rapid dissemination and prevention.

It's not like the wind shear situation where you have to detect it and try to get information rapidly to a pilot because wind shear we can't prevent, but runway incursion with proper techniques and operational procedures we can prevent.

Mr. VALENTINE. I'm sure that ALPA was asked to comment on the FAA human factors research plan.

Mr. O'BRIEN. That's correct, we were.

Mr. VALENTINE. Can you give us just a general overview as to what your—your comments——

Mr. O'BRIEN. Well, first of all, I'd like to—like to compliment ATA for the leadership role they took within the industry in stimulating a sort of togetherness, of one voice, with respect to getting industry comments into the FAA to develop a plan.

Back before the ATA really took the bull by the horns in this area, the FAA itself had conducted a series of seminars around the country—late '70s and early '80s. Walter Lufsley headed up that effort. And as a result of that effort produced a research and development—a human factors research and development program. And funds were identified—funding needs were identified for that program.

However, sadly to say, with the implementation of that program, late '84 early '85, the funding amounts made available to that were sadly lacking, came nowhere near meeting the envisioned requirements. And so, therefore, that program really never got off the ground.

We think now with the ATA initiative and the industry coming on board and assisting in that plan, and the 1988 Aviation Safety Research Development Act, those two factors will contribute to—enable us to have a new look and a new start. And we think that we can build upon that and put together a program that is very worthwhile.

Mr. VALENTINE. Mr. Brown, can you tell us how the the aircraft owners and—well, the aircraft owners. How do they contribute to the—without getting into a—I know it's late in the day—without getting into an extra amount of detail, maybe you would want to—to take this and just send—send us something or send the committee something in your answer.

How do the owners contribute to the expense of maintaining airports now? Regularly scheduled airlines, there's a—what is it, eight percent?—eight percent tax on every airline ticket that's sold at National Airport, which would amount to substantial revenue. And I'm sure that there are—the taxes on the airplanes, the sale of airplanes, and all kinds of other charges—perhaps on tires and equipment, and so on.

But how do private airplane owners contribute to the upkeep of the national network of airports?

Mr. BROWN. The answer is very brief, Mr. Chairman. In addition to taxes on the products that we purchased, as you mentioned, there's also a tax on aviation fuel, both jet fuel and av gas, which we purchase and consume. And those taxes go into the Aviation Trust Fund.

Mr. VALENTINE. And that's—of course, the airlines would be paying the same tax?

Mr. BROWN. Well, yes, that's correct. And, of course, actually the primary contribution comes from the passengers and the tickets.

Mr. VALENTINE. Uh-huh. You wouldn't pay at some airports, say, a landing fee or some maintenance fee if you—if you—well, I don't need to get into all that. If you have anything else to add to that—and it just was a point of some interest to me, I don't—I don't ask that question because I have any fault to find with it. It's like the, I guess, the fee that I pay and most of us to drive on the interstate highway system.

Mr. BROWN. Just briefly, Mr. Chairman, you're absolutely correct. We pay landing fees and other fees on the airport. I thought your question was specific to the Aviation Trust Fund. Those fees don't go into the Trust Fund. They go to the local airport operator.

Mr. VALENTINE. I was thinking about all—all costs that go into the maintenance of this—the system.

Mr. Fleming, how much work are the airline and aircraft manufacturing industries doing to support the FAA R&D in the—in the areas of aging aircraft?

Mr. FLEMING. Mr. Chairman, the answer is a great deal of work. FAA convened an Aging Aircraft Conference last June. From that conference the industry participants developed recommendations for joint government/industry action.

That program is well under way now. An apparatus of committees and working groups has been established to carry out that work. And we have already seen recommendations from that parent steering committee group for modifications to Boeing aircraft. There will be similar recommendations for modifications to Douglas Aircraft submitted within a short few weeks, followed later by recommendations for needed modifications to all other aircraft types, including those manufactured outside the United States.

So the answer, Mr. Chairman, is that there's been a very aggressive program under way. It's not yet complete.

Mr. VALENTINE. What about with respect to airport security and airworthiness and crashworthiness?

Mr. FLEMING. You have just covered a tremendous scope of activity.

As you well know and appreciate, the matter of improved security is of paramount importance to all. And one of the program enhancements that we have recommended in our statement concerns hopeful expenditure of additional funds, subject to appropriations, of course, for improved detection equipment.

In the areas of crashworthiness and specifically fireworthiness, a subject of great interest to your colleague, Mr. Lewis, I think a great deal of progress has been made in recent years. And those improvements were called out earlier by Mr. Laynor of NTSB, if memory serves me correctly. There is more work yet to come.

And that effort is largely due to the initiatives exercised by this committee.

Mr. VALENTINE. What is ATA's position with respect to the—to the new airports at—at Denver and at—at Chicago?

Mr. FLEMING. Mr. Chairman, we have not, as an Association, taken a position on either one of those airports. At Denver, the discussions and negotiations have taken place between the principal operators at that airport: United and Continental and the Denver authorities. We have not been involved in those discussions.

At the Chicago scene, there is a study that has been proposed to determine the need for a new airport in the Chicago area and we have supported that study. Obviously, it's just getting under way and there is nothing to report in that regard yet.

Mr. VALENTINE. That's—the Chicago thing is, as—as you've said, just in the preliminaries, but——

Mr. FLEMING. Yes, sir.

Mr. VALENTINE [continuing]. Denver is—is very—very close. Have they started construction?

Mr. FLEMING. No, sir, not to my knowledge. I believe there will be a referendum very shortly by the citizens as to whether they will or will not support going forward with that airport. And, of course, I think the construction decision clearly turns on the outcome of that referendum.

Mr. VALENTINE. What is the ATA position with respect to MLS?

Mr. FLEMING. Mr. Chairman, we do not support Mr. Poritzky's unbridled enthusiasm for the Microwave Landing System. We support the potential benefits that may be gained from the ability to fly curved or segmented approach paths. There is no dispute that I know of about the potential benefits of that capability.

However, since MLS was first conceived, airborne capability has greatly improved, and we believe in our modern airplanes with digital automatic flight control systems, that we may well already have, or could very easily have, that same approach capability without need to go to the Microwave Landing System.

Now, having said that, MLS has been a subject of much dispute, as you know—even amongst those of us here at this table. We have agreed to work cooperatively with the FAA, with other elements of the user community, and with the airport's people, on a series of

operational demonstration projects, which have been developed by FAA to try and get at the answers to the question that you asked.

Those operational demonstration programs will be ongoing through 1991. We are all committed at the end of 1991 to reach a decision on whether or not the FAA should go ahead with the proposed second buy of MLS ground units.

We hope that working together we will reach a mutual conclusion. We may not.

Mr. VALENTINE. Mr. Brown, from the perspective of general aviation—of the general aviation pilot—what is your estimate as to the magnitude of the runway incursion problem?

Mr. BROWN. Well, clearly, Mr. Chairman, there is a problem at the major congested airports. However, this issue often, as some other issues, in our view, can be exported to airports where there clearly is no problem because the congestion level is much, much less.

At the typical general aviation airport, we don't have near the problem with runway incursions. And as you probably recognize, Mr. Chairman, at most general aviation airports there is not an air traffic control tower because the density of operations is low enough that it's—that level of control is not required.

In addition, a typical general aviation airport has a layout or a runway configuration where you can see very well around the airport. And you just tend not to have the problem because you don't have the traffic and you have a smaller, more finite, facility.

Mr. VALENTINE. Thank you.

Mr. Brown, you commented on the—on the lessening quality of aviation weather products from the FAA ATC system.

Do you think that this is an unexpected result of the Automated Flight Service Station program or is it due to the stalemate between FAA and NWS on who's job it is to provide the specialized aviation weather products, or both?

Mr. BROWN. Mr. Chairman, I think it's—it's both. But primarily a problem associated with the automation of the FAA's Flight Service Station program.

While the NWS and FAA relationship that's—which is largely incompatible and neither one wanting to take the lead aggravates the problem, it's primarily an FAA responsibility to provide aviation weather to pilots, and has been historically.

Unfortunately, Mr. Chairman, FAA, in their plan to automate the Flight Service Station program has not delivered the automation. They've been slow to invent the technology. That NAS program is quite far behind. And, thankfully, over the years, the Congress has withheld funding and held the FAA to a very specific technology performance standard known as Model 1. This is the automation system that FAA committed to introduce.

They have introduced it on a limited basis but they have reduced services around the Nation at the same time they've been deploying that product.

So our key difficulty in this entire program, Mr. Chairman, is that the technology has not been deployed quickly and that the other services have been withdrawn at the same time. And we're thankful for the Congress' support over the years on that particular problem with FAA.

Mr. VALENTINE. Thank you, sir.

I have a couple of announcements to make. We—we do thank you gentlemen, all of you, for your participation in this hearing. And those of you who are experienced in this sort of thing—as I'm sure most of you are—you—you shouldn't read anything inhospitable in the fact that this room is not flooded with Members, and that it's dwindled to just me and thee.

Mr. Lewis left a note here stating that he had to meet with some constituents and had to leave us and—we do appreciate very much your taking the time to prepare yourselves for the coming with us. Thank you all for coming.

Let me announce again, now tomorrow we will begin again at 2 p.m.—not here, but in—not on this floor, but in Room 2247, the floor beneath us, where we will hear from FAA officials and—and others.

So we'll stand adjourned until tomorrow.

[Whereupon, at 4:45 p.m., the subcommittee was recessed, to reconvene at 2 p.m., Wednesday, April 12, 1989, in Room 2247, Rayburn House Office Building.]

OVERSIGHT ON THE FAA'S FISCAL YEAR 1990 R&D PROGRAM

WEDNESDAY, APRIL 12, 1989

HOUSE OF REPRESENTATIVES, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION AND MATERIALS,

Washington, DC.

The subcommittee met, pursuant to call, at 2:30 p.m., in Room 2247, Rayburn House Office Building, Hon. Tim Valentine (chairman of the subcommittee), presiding.

Mr. VALENTINE. We will continue with the hearing on the FAA's research and development budget for FY 1990.

Yesterday we heard testimony from organizations representing the users of the national aviation system, ranging from the commercial carriers to private pilots to airport operators to the general public that use the system as a mode of transportation.

They expressed support for what the FAA is doing, but they also expressed concern about what the FAA is not planning to do. Given the size of the requested budget, that is also the concern—or a concern of this subcommittee.

Today we will hear from the General Accounting Office to discuss the FAA's overall approach to R&D management. After that, Mr. Joseph M. Del Balzo, Executive Director of the FAA for the System Development—for System Development—will respond to the issues raised by the previous witnesses as well as to specific concerns of the Members of the subcommittee.

Mr. Lewis.

Mr. LEWIS. Thank you, Mr. Chairman.

I want to summarize my statement, Mr. Chairman, and ask unanimous consent that my entire statement be entered into the record.

Mr. VALENTINE. Without objection.

Mr. LEWIS. Thank you.

Yesterday we heard testimony from witnesses on the areas that need additional research. All were supportive of the FAA efforts to enhance the long-range research program.

Today we will hear a GAO analysis of the FAA research budget and the agency's presentations of its FY 1990 research program.

I have also been impressed with FAA's efforts to improve their long-range research program.

The ink was barely dry from the President's signature on the Aviation Safety Research Act last November when FAA held a public forum to get the research views of the aviation community.

Since that time the agency has drawn up proposals and increased funding for the several areas mentioned in P.L. 100-591, and will summarize many of those programs at today's hearing.

The agency has made great progress in developing the program and the major force behind the progress is Joe Del Balzo. But to be effective, the support must also come from the Administrator and the Secretary of DOT. So I look forward today, Mr. Chairman, to today's testimony.

Thank you.

[The prepared opering statement of Mr. Lewis follows:]

HON. TOM LEWIS (R-FL)
OPENING STATEMENT
FAA RESEARCH PROGRAM OVERSIGHT
APRIL 12, 1989

THANK YOU MR. CHAIRMAN.

YESTERDAY WE HEARD TESTIMONY FROM WITNESSES ON THE AREAS THAT NEED ADDITIONAL RESEARCH. ALL WERE SUPPORTIVE OF THE FAA EFFORTS TO ENHANCE THEIR LONG-RANGE RESEARCH PROGRAM. TODAY WE WILL HEAR A GAO ANALYSIS OF THE FAA RESEARCH BUDGET AND THE AGENCY'S PRESENTATION OF ITS FY 1990 RESEARCH PROGRAM.

I HAVE ALSO BEEN IMPRESSED WITH FAA'S EFFORTS TO IMPROVE THEIR LONG-RANGE RESEARCH PROGRAM. THE INK WAS BARELY DRY FROM THE PRESIDENT'S SIGNATURE ON THE AVIATION SAFETY RESEARCH ACT LAST NOVEMBER WHEN FAA HELD A PUBLIC FORUM TO GET THE RESEARCH VIEWS OF THE AVIATION COMMUNITY. SINCE THAT TIME THE AGENCY HAS DRAWN UP PROPOSALS AND INCREASED FUNDING FOR THE SEVERAL AREAS MENTIONED IN P.L. 100-591, AND WILL SUMMARIZE MANY OF THOSE PROGRAMS AT TODAY'S HEARING.

NEVERTHELESS, I AM CONCERNED WITH THE OVERALL SUPPORT OF THE AGENCY FOR THIS LONG-TERM PLAN. GAO WILL TESTIFY SHORTLY

THAT REPROGRAMMING OF RESEARCH FUNDS IS THE NORMAL ACTIVITY. CONSEQUENTLY, IT IS IMPOSSIBLE TO HAVE A CONTINUOUS LONG-TERM RESEARCH EFFORT IF THE FUNDING LEVEL IS CONSTANTLY CHANGING.

I AM ALSO CONCERNED ABOUT THE NUMBER OF RESEARCH SCIENTISTS AT THE AGENCY. THE MEAGER NUMBER OF 645 IS APPARENTLY ALSO SHIFTED FROM PROJECT TO PROJECT AS FUNDS ARE REPROGRAMMED. TO MAKE MATTERS WORSE, SEVERAL OF THE 645 ARE ON LOAN TO NONRESEARCH PROGRAMS. LET ME HASTEN TO ADD, I BELIEVE MR. DEL BALZO, TODAY'S FAA WITNESS, IS NOT THE CAUSE OF THE PROBLEM.

I QUESTION THE ADEQUACY OF THE FAA FY 1990 RESEARCH BUDGET REQUEST TO CONTINUE ON WITH LAST YEAR'S RESEARCH AND START THE LONG-TERM RESEARCH PROGRAMS MANDATED IN P.L. 100-591. IN FISCAL YEAR 1989 THE FUNDING LEVEL IS $160 MILLION AND THE FY 90 REQUEST IS ONLY $5 MILLION HIGHER. AT THE SAME TIME, THE ACT MANDATES AN ADDITIONAL $25 MILLION FOR HUMAN FACTORS RESEARCH.

FINALLY, I DO NOT THINK THE COMMUNICATIONS CHANNELS BETWEEN FAA AND THIS SUBCOMMITTEE ARE AS GOOD AS THEY SHOULD BE. WE HAVE EXPERIENCED DIFFICULTIES OVER THE YEAR IN RECEIVING BUDGET INFORMATION IN A TIMELY

FASHION. THE GAO TESTIMONY WILL POINT OUT THAT MANY FAA BUDGET DECISIONS DO NOT ENHANCE THE RESEARCH PROGRAM. IF THE COMMUNICATIONS CHANNELS WERE ADEQUATE, WE WOULD NOT HAVE TO HAVE GAO TO TELL US THIS.

LAST YEAR AT THIS TIME THE AVIATION SAFETY RESEARCH ACT HAD NOT BEEN INTRODUCED. IT WAS INTRODUCED ON MAY 25, 1988 AND SIGNED INTO LAW ON NOVEMBER 3, 1988. DURING THE QUICK JOURNEY THROUGH BOTH HOUSES, THERE WAS NOT A SINGLE VOTE AGAINST THE BILL.

CONGRESS HAS SPOKEN - WE WANT AN ACTIVE LONG-TERM RESEARCH PROGRAM AT FAA. THE

AGENCY HAS MADE GREAT PROGRESS IN DEVELOPING THE PROGRAM AND THE MAJOR FORCE BEHIND THE PROGRESS IS JOE DEL BALZO. BUT TO BE EFFECTIVE, THE SUPPORT MUST ALSO COME FROM THE ADMINISTRATOR AND THE SECRETARY OF DOT.

I LOOK FORWARD TO HEARING TODAY'S TESTIMONY AND RECEIVING RESPONSES TO THE ISSUES THAT I HAVE RAISED.

THANK YOU MR. CHAIRMAN.

Mr. VALENTINE. Thank you, Mr. Lewis.

Our first witnesses are Mr.—Mr. Victor Rezendes, Associate Director for Transportation, U.S. General Accounting Office, and Mr. Allen Li. And we're happy to have you gentlemen. If you would introduce your associate or associates. And your prepared statement will appear in the record as presented to us and you may proceed to summarize it or otherwise proceed as you deem appropriate. We are glad to have you.

STATEMENT OF VICTOR S. REZENDES, ASSOCIATE DIRECTOR, RESOURCES, COMMUNITY, AND ECONOMIC DEVELOPMENT DIVISION, ACCOMPANIED BY ALLEN LI, ASSISTANT DIRECTOR, AND ROBERT D. WURSTER, EVALUATOR-IN-CHARGE

Mr. REZENDES. Thank you, Mr. Chairman.

On my right is Bob Wurster. He's the—our Evaluator-in-Charge of our work on the research and development area.

I would like to submit my full statement for the record and summarize it, if I may.

We appreciate the opportunity to summarize for the subcommittee our work on the Federal Aviation Administration's Research, Engineering and Development program.

Our statement today will provide observations in two areas:

First, FAA's compliance with the Aviation Safety Research Act of 1988 and the controls FAA uses to manage its research program.

In summary, while FAA can still take steps to make its recently restructured research program more responsive to the Aviation Safety Research Act, the agency has made many positive changes.

For example, FAA has issued a new research plan, revamped its organizational structure for managing the program, embarked on research in key areas named in the Act, and asked for advice from the aviation community.

On the other hand, some requirements of the Act remain unfulfilled and make it difficult for the Congress to be assured that resources are being used most effectively and that FAA's research plan is being carried out as intended.

For example, FAA issued the latest plan without the project cost and staffing information called for in the Act.

Further, while the agency exceeded the Act's requirement for 15 percent long-term research, FAA did not identify those projects it classifies as long-term.

In addition, while we did not conduct an exhaustive review of FAA's management controls over its research program, we did find some weaknesses in FAA's policies and procedures for ensuring consistent resource use and in the availability of reliable data.

These are the generalities, Mr. Chairman, now I want to briefly provide you with some of the specifics behind them, particularly relating to the four key elements of the Aviation Safety Security Research Act.

The first key element, as you know, requires FAA to submit an annual plan with detailed costs, schedule, and staffing data for each project. As required, FAA issued its research plan in January of 1989 but it—while it contains general schedule information on

each project, FAA has not included detailed annual resource estimates.

FAA officials told us that because resource needs are subject to change, they do not believe that attempting to quantify such unknowns and then represent these numbers as detailed estimates in their budget submission or plan would be useful.

We believe, however, that long-range planning for research—resource—needs is important and that the results of that planning should be included in budget justifications.

Secondly, the Congress set 15 percent as the minimum portion that FAA should devote to long-term research because it believed the agency did not look far enough into the future and focused only on short-term, clearly achievable goals.

Our analysis shows that FAA's overall program adheres to this criteria and, indeed, $58 million, or 35 percent, of this year's request is intended for projects with exclusive, long-term benefits.

Although FAA could have included this information in its budget submission, as required, FAA officials said that the budget review process was too far along when the Act was passed to do this. They plan to include it in next year's submission.

Third, Mr. Chairman, we found that FAA's fiscal year 1990 budget contains funding to varying degrees for each area of research mandated by the Act.

For example, FAA requests funding for Aging Aircraft Program, for the first time, and has requested increased amounts for research on human factors, aeromedicine, fire safety, and dynamic simulator modeling. Overall, approximately 21 percent of FAA's fiscal year 1990 request is allocated to these research areas. And the spending trend for almost all of these areas is generally upward.

As for the fourth and last key element of the Act, the requirement to appoint a research advisory committee, FAA has taken positive steps to comply. FAA issued a charter to its committee on February 10th, 1989, and named its members, including representatives from user groups, universities, corporations, and other government agencies. However, the committee has not yet made plans for its first meeting.

We also note that FAA did solicit advice from user groups on its new research plan. But they did not receive these views in sufficient time to alter the plan.

FAA officials told us they would incorporate these views in the next plan update and budget cycle.

I would now like to change the focus of my testimony, Mr. Chairman, to discuss FAA's management controls of its research program. Specific weaknesses we found include FAA's not having policies for setting relative priorities among projects or for transferring funds among subprograms.

This means that the most important research, the less glamorous and often further from completion, could be pushed aside to satisfy the immediate needs of the present, thus sacrificing longstanding program goals.

Though ad hoc, this could be a satisfactory way of setting priorities. However, if it occurs with great frequency, the destructive ef-

fects of achieving overall program goals could outweigh the positive effects of responding to current needs.

We found that during fiscal year 1988, funds were transferred among 70 of 101 subprograms in FAA's research program.

Because of the extent of this activity, the relatively low level in the agency at which the fund transfers occur, and FAA not having consistent criteria on which to base these transfers, we are concerned about the agency's ability to meet the goals and objectives it plans to establish for its newly restructured organization.

We believe that FAA should be free to transfer funds when necessary, but changes should require the review and approval of top management.

Further, FAA does not maintain and, therefore, cannot report adequate project staffing and scheduling data. This makes it difficult for FAA managers or for the Congress to oversee the agency's employment—deployment—of its research resources.

Mr. Chairman, FAA's management control also has its positive side. For example, FAA has taken several steps toward improving its research program, such as reorganizing to establish central control, appointing interservice working groups to develop research requirements and evaluate budgets, and initiating periodic program reviews to keep management informed of programs status, accomplishments, and important milestones.

We believe that initiating these efforts is a step in the right direction. However, it is premature to assess their effectiveness given the recent nature of these actions.

In closing, I would conclude that in issuing a new research plan, reorganizing itself to better manage research, and responding with plans for research in each of the areas named in the Act, FAA has shown the ability to efficiently redirect a significant portion of its research in response to congressional direction, and demonstrated a tangible desire to improve its program.

Some additional steps still need to be taken, however, such as including cost and staffing data to the extent possible in the plan, setting relative priorities among programs, establishing criteria for transferring funds among subprograms, and maintaining staffing and scheduling data.

In our opinion, these steps should enhance FAA's responsiveness to congressional directives and ensure that FAA's research program focuses on the most pressing aviation needs.

Mr. Chairman, that concludes my statement. I'd be delighted to take any questions.

[The prepared statement of Mr. Rezendes follows:]

United States General Accounting Office

GAO

Testimony

FAA Research, Engineering and Development Issues

For Release
on Delivery
Expected at
2:00 p.m. EDT
Tuesday
April 12, 1989

Statement of
Victor S. Rezendes, Associate Director
Resources, Community, and Economic
Development Division

Before the
Subcommittee on Transportation, Aviation and Materials
Committee on Science, Space, and Technology
House of Representatives

GAO/RCED-T-89-21

Mr. Chairman and Members of the Subcommittee:

We appreciate the opportunity to summarize for the Subcommittee our on-going work on the Federal Aviation Administration's (FAA) Research, Engineering and Development (RE&D) program. Our statement today will provide preliminary observations in two areas: (1) FAA's compliance with the Aviation Safety Research Act of 1988 and (2) the controls FAA uses to manage its RE&D program. We base our observations on work we are currently doing for Committee Chairman Roe to assist the Committee as it reviews FAA's $165 million fiscal year 1990 RE&D budget. Our work involves developing and analyzing information on FAA's funding, staffing, and scheduling of RE&D subprograms. Although we have not completed our work in these areas, we have prepared a fact sheet entitled, Aviation Research: Information on FAA's Research, Engineering, and Engineering Program (GAO/RCED-89-122FS), that presents some of our initial results. We have brought a limited number of copies of that fact sheet with us today.

In summary, while FAA still can take steps to make its recently restructured RE&D program more responsive to the Aviation Safety Research Act, many positive changes have occurred. To its credit, FAA has issued a new RE&D Plan, revamped its organizational structure for managing RE&D, embarked on research in key mandated areas, and solicited advice from the aviation community. On the other hand, some requirements of the Act remain unfulfilled to the degree that the Congress cannot be assured that resources are being used most effectively and that FAA's RE&D Plan

is being carried out as intended. For example, FAA issued the latest Plan without the requisite project cost and staffing information. And, while the agency's program contains at least the mandated 15 percent in long-term research, specific research projects of a long-term nature were not identified as required in FAA's fiscal year 1990 budget. In addition, while we did not conduct an exhaustive review of RE&D management controls, we did find weaknesses in FAA's internal controls and procedures for ensuring consistent resource use and in the availability of reliable data.

FAA'S RESPONSIVENESS TO THE ACT

As you know, the Aviation Safety Research Act of 1988 requires FAA to

-- submit an annual plan with detailed annual cost, schedule, and manpower data for each project, as well as a report of accomplishments for the preceding year;
-- allocate not less than 15 percent of its fiscal year 1990 budget to long-term research;
-- undertake research on aircraft structures, fire safety, human factors, aeromedical research, and computer simulation models; and
-- establish a research advisory committee.

As I will now discuss, we found that, with a few exceptions, FAA was generally responsive to these four requirements.

Resource Estimates Not Included in RE&D Plan

As required, FAA recently issued its new RE&D Plan. However, the January 1989 Plan does not comply with all of the requirements of the Aviation Safety Research Act. While it contains general schedule information on each project, FAA has not included detailed annual estimates of the cost and staffing levels for each project for the first 2 years of the Plan. FAA officials told us that resource needs for research are subject to change at the project level or, as in the case of new programs such as aging aircraft, estimates for these needs will not exist until the projects are under contract. Therefore, officials do not believe that attempting to quantify such unknowns and then represent these numbers as detailed estimates in the budget submission or the plan would be useful. We believe, however, that long-range planning for RE&D resource needs is important and that the results of that planning should be included in budget justification and planning documents at the lowest level possible. Depending on the maturity of the research program, this level could vary from among the project, subprogram, and program budget estimates.

FAA did not submit a report of accomplishments with this plan because of the many recent changes to the program. Officials say, however, that such a report will accompany future plan updates.

Percentage of Long-term Research Is Not Highlighted

The Congress set 15 percent as the minimum proportion that FAA

should devote to long-term research[1] because it believed the agency did not look far enough into the future and focused only on short-term, clearly achievable goals. Our analysis of subprograms[2] carrying over into fiscal year 1990 shows that FAA's overall program adheres to this criteria and, indeed $58.3 million, or 35.3 percent, of this year's request is intended for projects with exclusive long-term benefits. FAA officials said that the budget review was too far along when the Act was passed to do include long-term information. They plan to include it in next year's submission.

RE&D Budget Generally Includes
Research Areas Named in the Act

FAA's fiscal year 1990 budget contains funding to varying degrees for each area of research mandated by the act. For example, FAA requests funding for an aging aircraft subprogram for the first time and has requested increased amounts for research on human factors, aeromedicine, fire safety, and computer simulation modeling. The table in attachment I highlights trends in those programs and subprograms responsive to the act for fiscal years 1987 through 1990. Overall, approximately 21 percent of FAA's fiscal year 1990 request is allocated to these research areas, as shown in attachment II.

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[1]According to the Act, a long-term research project is one that is unlikely to result in a final rule making within 5 years, or in initial installation of operational equipment within 10 years after the project begins.

[2]A subprogram is a discrete project or group of projects; it is the lowest level for which FAA maintains funding information.

Research Advisory Committee Has Been Established

FAA has complied with the requirement to appoint a Research Advisory Committee. This requirement was established to ensure that the agency had expert advice available to it in planning its research program. FAA issued a charter for the committee on February 10, 1989, and named its members, including representatives from user groups, universities, corporations, and other government agencies. However, the committee has not yet held its first meeting. FAA did solicit advice from the aviation community on its new RE&D Plan at a conference last December, but the agency did not receive these views in sufficient time to alter the plan or the fiscal year 1990 budget. FAA officials say that they will incorporate these views in the next plan update and budget cycle.

OBSERVATIONS ON MANAGEMENT CONTROL

The Federal Managers' Financial Integrity Act of 1982 requires executive agencies to establish and maintain systems of internal controls in accordance with standards developed by the Comptroller General. One of these standards requires that an agency establish internal control systems that provide reasonable assurance that its program objectives will be accomplished. In FAA's case, for example, internal controls would help the agency to adhere more closely to the Aviation Safety Research Act and to ensure that research program goals are met.

While we did not conduct an exhaustive review of RE&D management controls, we did find weaknesses in FAA's internal

controls for ensuring consistent resource use and in the availability of reliable data. Specifically, FAA does not have a consistent or systematic means of setting relative priorities among projects or for transferring funds among subprograms. This means that established research programs--though less glamorous or farther from completion--could be pushed aside to satisfy immediate needs, thus sacrificing longstanding program goals. While this could be a satisfactory though ad hoc way of setting priorities, if it occurs with great frequency, the disruptive effects on achieving overall program goals could outweigh the positive effects of responding to current needs. Further, FAA does not maintain and therefore cannot report adequate project staffing and scheduling data, thus making it difficult for FAA managers or the Congress to oversee the agency's deployment of its RE&D resources. However, FAA has initiated steps toward improving some of these areas.

Priorities Are Not Established

FAA has not established priorities for its fiscal year 1990 RE&D budget or its new RE&D Plan. This means that projects are not distinguished in terms of which are more important and, therefore, more deserving of scarce resources. Last year, we pointed out the need for FAA to set priorities among projects in its multi-billion dollar air traffic control modernization program--the National Airspace System Plan (NAS Plan)--so that objective trade-offs could be made based on project benefits, costs, and

schedules.[3] We believe that setting priorities is just as important in the RE&D program where, like the NAS Plan, numerous discrete subprograms exist that address areas ranging from aeromedical research to airborne collision avoidance systems. Additionally, RE&D projects are managed throughout the organization, including the Technical Center and the Civil Aeromedical Institute. Thus, because of the many and diverse competing sponsors of research, central guidance for establishing a hierarchy among research requirements needs to be established.

FAA acknowledges the need to set priorities and will begin to address this problem during the coming year by implementing a new management control process. FAA plans for the new process to be a top-down approach built around the four major mission areas highlighted in the new RE&D Plan: capacity, safety, security, and efficiency. These mission areas will form the framework for analyzing and setting priorities for requirements, setting goals and objectives, and measuring improvements. Currently, the process is in draft format; and plans call for working groups, with participants from throughout the organization, to establish and set priorities for requirements and evaluate future budgets against those requirements.

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[3]AIR TRAFFIC CONTROL: Continued Improvements Needed in FAA's Management of the NAS Plan (GAO/RCED-89-7, Nov. 10, 1989).

Criteria on Which to Base Reprogramming Actions Does Not Exist

FAA has not established criteria for approving transfers of funds among RE&D subprograms. As a result, FAA has no means to ensure that it will spend funds in accordance with the priorities it plans to develop. We believe such criteria are needed if the agency is to maintain control over the program during budget execution.

During our review of RE&D subprogram funding for fiscal years 1987 to 1989, we noted that such transfers--called reprogrammings--were numerous. For example, during fiscal year 1988, reprogramming actions changed funding in 70 of the 99 subprograms FAA designated in its congressional submission. Eighteen of these increased or decreased by more than $500,000 with several between $3 million and $9 million. According to FAA's program analyst responsible for reviewing reprogramming actions, changes come about in many ways and from different places. For example, congressional interest is at least one important source and was responsible for funds being added to the crashworthiness program. A reprogramming also can be initiated based on direction from various levels within FAA in response to compelling research findings from programs in other agencies, including the National Aeronautics and Space Administration, the National Science Foundation, and the Department of Defense. Others are initiated for administrative reasons, including the need to distribute funds carried over from previous years. In addition, in response to recommendations made at an FAA-

hosted international conference, FAA established an aging-aircraft subprogram in fiscal year 1989 with funds transferred from other RE&D projects.

Currently, RE&D reprogrammings are approved by the FAA organization within which the project resides without involving the FAA's Associate Administrator for Advanced Design and Management Control (ADM)--the FAA official whose organization has overall RE&D responsibility. A program analyst in ADM's Management Control Service sees all reprogramming actions, but she brings an action to ADM top management attention only if she feels it warrants their interest. However, no criteria exist for management to approve these actions, or for ADM's analyst to decide when to request higher management involvement. This is a result of the situation described earlier wherein no means or policy exists with which to set priorities among projects. Thus, according to FAA officials, immediate needs--such as funding NAS Plan projects--can sometimes be viewed as the most pressing and result in siphoning funds from established projects in other areas.

Because of the extent of reprogrammings we identified in the past 2 years and FAA's not having criteria on which to base such reprogrammings, we are concerned about the agency's ability to meet the goals and objectives it plans to establish as part of its new control process. We believe that FAA should be free to transfer funds when necessary but only within established parameters approved by appropriate levels of the organization. Major changes

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in programs or subprograms should require the review and approval of top management.

Information Describing FAA's Program Is Not Readily Available

In the process of performing our work for Chairman Roe, we noted that FAA does not have readily available historical information on RE&D subprograms, such as the number of FAA staff on the projects, project milestones, and the names of contractors or even the project manager. To meet our data needs, FAA undertook a special effort to obtain this information.

Indeed, maintaining and reporting such data are important to achieving the RE&D program's goals because with this information program managers could better evaluate program progress and plan future program direction. Moreover, those charged with overseeing the program also would have the historical information they need. For example, FAA needs this information to demonstrate to the Congress that the agency has an adequate vision of what is needed in aviation research. Last fall, FAA submitted a $212 million budget to the Secretary of Transportation, a request which subsequently has been reduced to the $165 million request your Subcommittee is evaluating. The acting service director of FAA's new RE&D control organization told us of his difficulty in defending the RE&D budget without good historical data.

To address its need for RE&D data, FAA has contracted to develop a management information system on RE&D subprograms. The system is being developed so that FAA can monitor variances in RE&D activities and projects from established goals and objectives.

FAA plans a phased implementation of the system with the first phase focused on the RE&D budget subsystem and scheduled for completion this July. Remaining phases are planned for implementation during fiscal 1990.

Positive Changes in the RE&D Program

FAA has taken some steps toward improving its RE&D program, such as reorganizing to establish central control; appointing Interservice working groups to develop RE&D requirements and formulate RE&D budgets; and initiating periodic program reviews to keep management informed of projects' status against plans, major accomplishments, and important milestones. We believe the initiation of these efforts is a step in the right direction. For example, central control will establish an appropriate organizational framework within which reprogramming criteria can be established. However, it is premature to assess their effectiveness, given the recent nature of these actions.

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To summarize, in issuing a new RE&D Plan, reorganizing itself to better manage research, and responding with plans for research in each of the areas named in the act, FAA has demonstrated a tangible desire to improve its program and to respond to congressional direction. Some additional steps still need to be taken, however, such as including cost and staffing data in the budget and highlighting the portion of the program that is devoted to long-term research.

While it is premature to assess the effectiveness of FAA's new RE&D program, our work for Chairman Roe suggests that specific weaknesses in FAA's policies and procedures need to be addressed, including setting relative priorities among projects, establishing criteria for transferring funds among subprograms, and maintaining staffing and scheduling data. In our opinion, application of these management controls over the RE&D program will enhance FAA's responsiveness to congressional directives such as the Aviation Safety Research Act and ensure that FAA's research program focuses on the most pressing aviation needs.

ATTACHMENT I

ATTACHMENT I

TRENDS IN RESEARCH AREAS NAMED
IN THE AVIATION SAFETY RESEARCH ACT
FISCAL YEARS 1987 TO 1990
(Dollars in thousands)

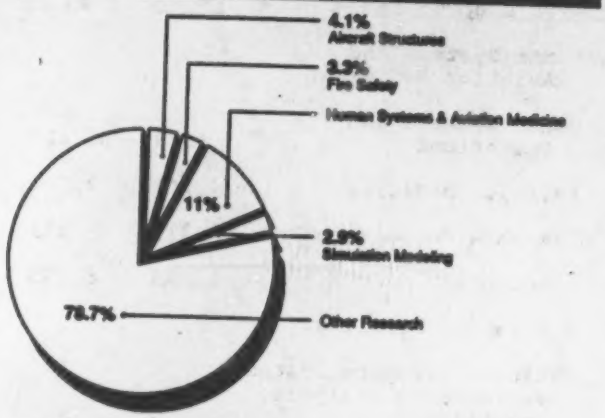
Area of Research: Program/subprogram	Obligations FY 87	Obligations FY 88	Obligations FY 89[a]	Proposed budget, FY 90
1. Human Systems and Aviation Medicine:				
Human Systems and Operations	$178	$2,420	$5,157	$10,592
Aviation Medicine	4,502	3,766	7,082	6,513
FAA/NASA Cooperation	714	812	938	961
Subtotal	5,394	6,998	13,177	18,066
2. Simulation Modeling:				
National Airspace System Performance Analysis Capability	0	0	0	2,500
Airspace Systems Models	0	0	0	773
Simulation Models	0	764	1,568	1,465
Subtotal	0	764	1,568	4,738
3. Aircraft Structures:				
Aging-Aircraft	0	0	3,858	4,054
Crashworthiness/ Airworthiness	1,979	1,680	2,432	2,733
Subtotal	1,979	1,688	6,290	6,787
4. Fire Safety:				
Aircraft Systems Fire Safety	3,892	3,544	4,321	5,547
Grand Total	$11,265	$12,986	$25,356	$35,138

[a]Fiscal year 1989 obligations are estimated as of January 31, 1989

ATTACHMENT II

ATTACHMENT II

PERCENTAGE OF FY 99 R,E&D BUDGET REQUEST DEVOTED TO SPECIFIC ACTIVITIES LISTED IN THE AVIATION SAFETY RESEARCH ACT OF 1988



FY 99 R,E&D Budget Request is $185 million.

Aviation Medicine program includes work on human factors associated with Aging aircraft.

Other Research category includes all R,E&D subprograms not specifically identified in the Aviation Safety Research Act of 11988.

Mr. VALENTINE. Thank you, sir.

You stated that the FAA didn't—did not receive comments on the RE&D plan in sufficient time to change the plan prior to publication, but will incorporate them in the next update cycle.

Mr. REZENDES. Yes, sir.

Mr. VALENTINE. Does the FAA plan to hold their RE&D Conference earlier next year, in your opinion, so that comments can be incorporated into the plan for that year?

Mr. REZENDES. We're not aware of the scheduling of the Conference next year. I have no idea.

Mr. VALENTINE. Your—has—have you—has any effort been made to make a determination about—on—on that particular question, or do you—do you deem it inappropriate to make any inquiry about that?

Mr. REZENDES. No, I don't think we inquired at all. Do you recall it?

Mr. LI. No. I think your—the question, Mr. Chairman, probably pertains to the timing of the plan relative to when the budget would be submitted.

And I agree that there—there must be some relationship between the two. The unfortunate thing about it is since the budget process occurs so much earlier in the year, that it's almost impossible for FAA, if they had the—the Conference, as they have right now, in the December time frame, obviously, to make the—the next budget, which comes out in two months.

So I think that there has to be some thought to try to marry both processes so that we do get that right information in—in the next budget cycle.

Mr. VALENTINE. All right.

Your testimony states that significant reprogramming has occurred in the past among R&D projects. While the need for flexibility to handle un—unanticipated requirements, such as aging aircraft, is certainly understandable, is there a downside, in your opinion, to such ad hoc changes?

Mr. REZENDES. Yes, there is. I—as I mentioned in my testimony, to the extent that this happens routinely, the program goals and objectives established early in the plan can't be achieved, plus you have another downside of project managers have a greater degree of uncertainty as to the funding for their particular program. And that makes it difficult for planning out and awarding contracts.

Mr. VALENTINE. You stated that about 35 percent of FAA's FY 1990 RE&D budget request is allocated to long-term research.

Mr. REZENDES. Yes, sir.

Mr. VALENTINE. The Aviation Safety Research Act requires that at least 15 percent of the annual R&D budget to be so allocated. Do you feel that the FAA has made a cultural—cultural change in their attitude toward long-range research as an—as an element of their charter?

Mr. REZENDES. No, we don't. In fact, I think it may be a function of the definition in the Act. It might be appropriate to explain a little bit about how we went about determining that.

We asked each of the project managers—we gave them the definition in the Act which basically says that a research project which will result in rulemaking in five years and an operation of equip-

ment in ten years—using that definition, which are their projects for long-term.

Basically, that's the—35 percent is the response we received from these project managers. That would include, for example, systems such as AAS, voice, VSCS systems, which were long-term projects—equipment projects.

Those were also classified as long-term research even though in the next few years they'll begin to become operational. So I think we may have a definition problem.

I don't think FAA has changed the type of research that they're doing. But I think they can demonstrate through the—compliance with the definition that they are meeting the 15 percent requirement.

Mr. VALENTINE. In your testimony you mentioned numerous re—reprogramming actions. Were these—were these funding adjustments within the guidelines of the Airport and Airway Safety and Capacity Expansion Act of—of '87?

Mr. REZENDES. The—the short answer is probably yes. But the more we looked into this issue, the more complex the answer is. It is not that simple, although obviously it's a very simply and—question.

The—as you mentioned, the Airport and Airway Safety and Capacity Expansion Act requires that any reprogramming of 10 percent from authorization be—be reported. The problem here is that the authorized level for R&D in FAA is—and their budget—and when you compare the two, the budget is probably 35 percent less than the authorization.

So the tripping mechanism here is the 10 percent from authorization levels. And overall, the—for 1989, for example, FAA was authorized $215 million. The actual obligations for 1989 were $165 million. And if you compare each of the seven areas, as we have, it doesn't appear that any one of them tripped the 10 percent of authorized levels.

Further compounding the problem—and I know I'm giving you a long answer to a rather simple question—is the fact that their R&D money is new year money. So you can have additional amounts spent in the current year obligated, which would be from previous year's appropriations.

So it's difficult, without going through an elaborate analysis, unless on a project-by-project basis, to determine whether in fact any of this would have tripped a 10 percent.

But just looking from overall figures, we would say probably not.

Mr. VALENTINE. Mr. Lewis?

Mr. LEWIS. Thank you, Mr. Chairman.

It's very interesting. Your answer to the chairman's question and looking at the law, I'm going to have—before we get back—we'll get back to that. There's a couple of other things I'd like to ask you, Mr. Rezendes.

You mentioned on page 2 of your testimony that FAA had issued the latest plan without the requisite project cost and staffing.

Would you tell me why this was the case?

Mr. REZENDES. Yes, we asked—we asked FAA why that was so. And basically we were told that they believed it was unnecessary, that it's difficult to come up with these estimates because it was up

to two years out, and that some of it was unknown and probably would not be known unless and till they issued the contracts, or awarded contracts. Plus, I think there was also a—a secondary issue here, and that was relating to OMB, who doesn't like to disclose future years' budgets.

But we think, and as we said in our—in our statement, that it's important to identify, to the extent that you can, at the lowest level you can, the resources you need to carry out those projects. It helps you establish priorities.

Mr. LEWIS. Well, I certainly agree with you. The—in the private sector, if you have to come up with a——

Mr. REZENDES. That's right.

Mr. LEWIS [continuing]. Three to five-year research program, you have to come up with the estimated dollar cost. You may not always be right in the estimated number of staffing. And if you didn't do that, you certainly wouldn't stay in business long. And I just don't understand why FAA can't use the same application. Maybe it's because we can always come back to Congress and ask for money for people. But this doesn't seem to be the case either because their technical people have declined over the years and they do not seem to be adding to that.

On the long-term research—let's stay on that a moment—you stated that 54.3 million, or 35.3 percent—again in relation to the chairman's question—of this year's request is intended for projects for exclusive long-term benefits.

I have great difficulty understanding that when they don't know what they're doing in the first—in the first case when we asked you.

And then in the second case, they have been able to do this. Does this mean that FAA's research budget has marked 35.3 percent of the funds for long-term research?

Mr. REZENDES. Technically, yes, I would say yes. But I think if you had—if you were unhappy with FAA's research efforts in the past.

Mr. LEWIS. I was.

Mr. REZENDES. And I think if you take that same definition and apply it retroactively over the last couple of years, I think they probably could have met the same requirement each year.

Mr. LEWIS. Okay.

Is—is the definition of long-term research uniform throughout FAA? Did you have any way of determining that?

Mr. REZENDES. As I mentioned, we asked each of the program managers to using this criteria whether in fact their project was long-term research. And I guess there was some disagreement between program managers as to what should be classified as long-term research—from the date the project was first established or from today's date.

I think if we would have asked going from today forward, we would have had a different percentage.

Mr. LEWIS. I guess that leads to my next question, again, the 70 percent, or the reprogramming actions of funding of 70 of the 99 subprograms certainly prohibits you from having a long-term research program if you're going to continue to alter and change

these. And of the 70 of the 99, 18 of these increased or decreased by more than 500,000. There were several between 3 and 9 million.

I don't understand how any research program could be long-term if the funding is constantly changing. In your opinion, how can it continue with continuity if reprogramming occurs such as this, on an annual basis?

Mr. REZENDES. It would be very, very difficult. I guess theoretically one could assume that one could reprogram into long-term research. But I think the—the inference of your question is that that's not so, and I'd say that's probably not so.

I think reprogramming occurs mostly to meet immediate current needs. You mentioned that 70 of the approximate 100 subprograms were impacted by reprogramming.

We did some calculations since our statement and I think the numbers are even worse in terms of dollar amounts.

We had about—we totalled up how many dollars would be involved in this, and it's about $45 million. So we're talking about two-thirds of the programs being impacted and about one-third of the dollars.

Mr. LEWIS. You stated that FAA, in your testimony, has not established a criteria for approving transfer of these funds among RE&D subprograms. Therefore, as a result, FAA has no means to ensure that it will spend the funds in accordance with the priorities it plans to develop.

Is this typical or atypical in comparison with other agencies?

Mr. REZENDES. I don't know. We don't know that much about that many research programs. But we did ask around to some of our other groups that do—that do work in some of the other areas, particularly in the NASA area. And I asked our folks there if there were any criteria that they used in terms of requiring reprogramming. And I was told in the NASA area, for example, that their reprogramming of changes of a quarter of a million dollars are required to be reported to Congress.

Mr. LEWIS. Now, when—when you looked at this—and you're familiar with this section of—of the Act.

Mr. REZENDES. Yes.

Mr. LEWIS. On the transfer of the 9 million, for example, is that—were you able to determine whether that was in line with or was it in contradiction to the Act as specified in any projects—seeding 10 percent of the amount authorized in such categories. If they want to spend any more than this, they actually have to come back and advise this Committee as well as the Appropriations Committee and the Committee on Commerce in the Senate.

Mr. REZENDES. I'm not sure what 9 million you're talking about, sir.

Mr. LEWIS. Well, do you have the Act with you?

Mr. REZENDES. Do you have a copy of the Act?

Yes.

Mr. LEWIS. Okay. On page—let's see—on 101—on 1491; 101/1491.

Mr. REZENDES. Oh, good.

Mr. LEWIS. I just want to also understand for the record, Mr. Chairman, we're not here to bash FAA in any way whatsoever. But at the same time, I just want to point out that the law was passed and signed and printed out by December 30th, and the GAO review

has already shown some—some variances in the law, some of it most likely justified and some are not. But this doesn't surprise me because it seems to me that the particular agency operation in the Washington area. And with the problems that we have and the priorities that were established, a lot of these things have not been established to this point, which I'm going to ask you about some more.

Mr. REZENDES. Sure.

Mr. LEWIS. But what I'm interested in now, would you say that the transfer of those funds would be in variance with that section of the law?

Mr. REZENDES. Technically, probably not. Again, this may entail a more detailed analysis and perhaps even a legal determination.

But from our review of the numbers, from the gross numbers—in fact, we put together a little schedule that maybe we could provide to you—is overall between the seven different research areas that—that are authorized, it seems relatively they maintained consistency throughout the years. Probably the reprogramming that has occurred has probably been within each of those. For example, the air traffic control comprises about 60 percent of the research budget. And I think it was 88 million was appropriated last—last year.

There was a lot of change of activities within projects within that authorization. We didn't see any wholesale change between, let's say, air traffic control and aviation weather.

Mr. LEWIS. In your—in your observations and reports with other agencies, how would you determine with the answers that you received and as you stated in your report, how can long-range research be conducted if there are no priorities to—time frames?

Mr. REZENDES. It—it would be very difficult. I guess under any program, if you had a random access to projects authorization that you could probably produce some positive results.

But under good management we would hope that there would be a strategy, both strategic and tactical, for accomplishing the results. To do that you need to establish priorities. And one of the best ways to do that is establishing resource needs and committing those to each of the projects.

Mr. LEWIS. In the reprogramming that you have examined—or your people have examined—how much of the reprogramming has been done outside the research area?

Mr. REZENDES. We didn't see any outside of the research.

Mr. LEWIS. Only in the research area?

Mr. REZENDES. Yes, sir.

Mr. LEWIS. Did you look at the other areas as well?

Mr. WURSTER. We did some preliminary work. We looked at their records but these were all internal within the R&D account.

Mr. LEWIS. So what is your assessment, then—gentlemen, what does FAA need to do in order to ensure that continuous long-term research is an agency priority?

Mr. REZENDES. Well, I think this committee and the recent Act has gone a long way to achieving that. We think you need to establish a clear plan, involve the aviation community in establishing that plan, setting priorities, and instituting management controls to give you the feedback on resource commitment and project

status and milestones throughout the year to ensure that you achieve those results.

Mr. LEWIS. I see.

Mr. LI. Mr. Lewis, the only other thing I—I would add to that is I think we need to continue to have this top management commitment by the—the administration, by the new Administrator coming on board. I think that's very important to continuance of—of all these good things that have been happening in the past few months.

Mr. LEWIS. That's a good point.

I'd like to just, if I could, Mr. Chairman, explore a little bit about the statement on page 10 about the FAA does not have readily available historical information on R&D. Some programs, such as number of staff on the projects and project milestones, and names of the contractors.

Is this a fact they can't tell you how many engineers they had assigned to a program, or how many computers and operators, programmers, and things of this nature?

Mr. REZENDES. Basically that's true. From what we understand, they used to have what they called "smart sheets" many years ago, where they maintained this data. But I believe that has fallen by the wayside either for lack of resources or interest for—for whatever.

But before you go on, the—obviously, some project managers are aware of the resources committed to their projects. And perhaps if you asked each individually whether they knew what their resources are and whether they are under control, they probably would say yes.

But under any management control system, you need an information system or process where top management, and management throughout the organization, are aware of what's occurring at each level within the organization. Unless you have that information more formalized and submitted so that it can be reviewed and exceptions identified and corrections made, you have no assurance that each of the various project managers are in fact achieving the results that you expected from them.

I don't know if you had anything you wanted——

Mr. LI. Mr. Lewis, the only other thing I would add is that they do know, obviously, how many engineers, how many chemists, they have. It's that distribution within the projects and the subprograms, and that is what we have—just today we have issued a report for—for the full committee on that distribution. And that was the part that we are alluding to in the statement that has been so difficult for FAA to distribute the staff and—and the resources amongst these particular subprograms so we could identify it for you.

Now we have done that, I believe that FAA is planning now to maintain that particular data base. So I—that's another encouraging sign as far as that's concerned.

Mr. LEWIS. I see.

So the information does exist and—does this—does this compare with other agencies' operations?

Mr. LI. Yes, sir. It does exist today, now, as a result of—of this particular exercise.

Mr. LEWIS. I see.

One other question in this area, that your information—the information that you provided in your analysis indicate that scientists were shifted when the reprogramming was done from one or—personnel, I should say, from one program to another, that they were shifted to that other program?

Mr. LI. No, we don't have any of that indication. And the reason why there's no indication as detailed as during the reprogramming progress is because FAA in—while they do have a knowledge of the amount of monies that get shifted from a subprogram to another subprogram, they don't keep track of what staff is being switched from one to the other. So there—that type of information is not available.

Mr. LEWIS. Would that be helpful?

Mr. LI. Yes, it would be.

Mr. LEWIS. It would be helpful?

Mr. LI. Yes, it would be.

Mr. LEWIS. It would be—would it be helpful for them to better do their job from accountability?

Mr. LI. Well, I think that our friends from FAA would probably say that it's a cumbersome thing to do to keep track of how these people get shifted on a weekly basis. But I think that the discipline that you would be building into the process of being able to say, what are the people I'm assigning?—I think that might be some incentive for them not to—to stick by their priorities. I think that that would probably be the incentive, Mr. Lewis.

Mr. LEWIS. Thank you, Mr. Chairman.

I'd like to thank you gentlemen very much.

Mr. REZENDES. Thank you, sir.

Mr. VALENTINE. Thank you.

I want to again express the appreciation of the subcommittee for your taking the time to come and be with us.

I don't know that this will be the case, but it might be that we'd have some questions to submit to you in writing.

Mr. REZENDES. That'd be fine.

Mr. VALENTINE. If we do that, then you'll hear from us.

Thank you again very, very much, all of you.

Our next witness is the Executive Director for System Development of the Federal Aviation Administration, Mr. Joseph M. Del Balzo. Welcome, sir.

Your prepared statement, as I've said to the other witnesses, will appear in the record and you feel free to summarize or give us a sketch of it, or otherwise proceed as you deem appropriate. Welcome, sir.

STATEMENT OF JOSEPH M. DEL BALZO, EXECUTIVE DIRECTOR FOR SYSTEM DEVELOPMENT, FEDERAL AVIATION ADMINISTRATION

Mr. DEL BALZO. Thank you, sir.

Mr. Chairman, Congressman Lewis, thank you very much, and I will submit a full statement for the record. And if I may, I would like to summarize this statement before you today.

Let me say at the outset how delighted I am to be here. This committee has made significant contributions to our agency over the years, and particularly so in the last year with the passage of the Aviation Safety Research Act of 1988. And I know that you had hoped for Secretary Skinner to be here with us today. And I would tell you that he is looking forward to sitting down with you in the future and discussing not just how important an R&D program is to the transportation system of tomorrow, but of a variety of other issues as well.

I would also say that the FAA appreciates the support this committee has provided for our efforts to restructure a research, engineering, and development program. It isn't often that a subcommittee chairman and Ranking Minority Member takes the time out of their busy schedule to spend a day—a full day—at a research facility under their purview. And I thank you for taking the time and the interest.

But I would also tell you that having, not knowing that you've taken that time, I come in a little bit of awe because there will be times when if I go like this I would like help from one of you in answering a question that you ask me. I would appreciate that.

There have been many changes since we last met and I would like to provide you with a broad overview of our program—where we are today and where we hope to be in the near and distant future.

Let me start. In the past decade, the air transportation system in the United States has experienced economic deregulation, traffic growth, and new controller work force, just as the R&D program of the '60s and '70s served as the basis of the plans and programs to address these changes and associated problems, there's no question but the R&D program of the '80s and '90s must also serve as a base to take us into the 21st century.

If we look back we find accomplishments that we can be proud of: R&D funding of the new computer system for the en route air traffic control centers, a host computer. Doing the design and development phase led to the successful replacement, without a hitch, no interruption, in air traffic service of the final, old IBM 9020 computer in 1988.

As a result of the R&D program in fire safety research, as you well know, we now have aircraft seat cushions with a fire blocking layer in commercial jet aircraft. The seat cushion on which you sit today when you fly is comfortable. It will provide you with 40 to 60 seconds more time to escape the aircraft in the event of a post-crash fire.

Last May, an aircraft containing fire blocking cushions crashed on takeoff at Dallas/Fort Worth. It was unfortunate. The aircraft was completely destroyed. Yet, 94 of 108 occupants survived.

Our analysis shows that up to one-third of those who survived were in fact saved by the fire blocking cushions.

In regard to explosive detection technology, last week Secretary Skinner announced that the FAA will require the deployment of explosive detection systems such as the Thermal Neutron Activation device at the busiest airports in the United States as well as overseas where U.S. airlines operate.

The TNA system is the result of three years of FAA directed research into ways to detect all commercial and military explosives that might be concealed in checked baggage and air cargo, including normally hard-to-detect plastic explosions—explosives.

TNA had a 95 percent effectiveness rate in detecting explosives and a low false alarm rate of just four percent. And as you know, the first TNA system will now be deployed in June of this year at New York's John F. Kennedy International Airport.

Research in the traffic management area resulted in the development of the aircraft situation display. This computer program enables air traffic to monitor all IFR aircraft flying in en route controlled airspace.

Last summer, the busiest time of the year, a runway was closed for needed repairs at Los Angeles International Airport. Normally that would have led to extended flight delays. Through the use of ASD to assist in traffic flow management, the expected delays did not occur. And a computer display of ASD is available which you saw an impressive demonstration.

These represent only a few of the products derived from past R&D efforts. Our problem today is to turn to the future and consider new challenges that face us in the 21st century.

When one starts with the environment, what will it be like? No question, air traffic is expected to continue to grow as the economy flourishes and the demand for air travel expands. Demographic changes in—in the work force will impact the system. The pilot work force is getting younger and less experienced as older pilots retire and total demand increases.

The controller work force will be undergoing a massive transition over the same time period. It's hard to believe that starting in the year 2001, thousands of controllers who were hired after the 1981 strike will be eligible for retirement, at about the same time that major changes to the air traffic control system are expected to become a reality.

Increased automation will place a high premium on understanding the relationship between the work force and automation and the design of fail soft systems that allow time for appropriate human intervention.

Constraints on capacity expansion are expected to continue for the remainder of the decade.

The security threat is not going to diminish. If anything, as our ability to detect weapons and explosives becomes more effective, terrorists will turn to other threats which must be anticipated and countered.

And, finally, there's the gradual revolution in the use of new materials and manufacturing processes being employed in aircraft construction. Fly-by-wire, a reality today that presents certification challenge; fly-by-light could become a reality during the next two decades.

FAA must develop new procedures for certification and inspection to enable the industry to achieve the full benefit potential for these materials and processes.

Just as we looked to technology over a decade ago, I believe that we must continue to look to technology to help prepare us to achieve the benefits of a strong and viable air transportation

system into the decade of the 21st century and beyond. To do this, the FAA has been restructuring both its organization and its R&D program.

I would like to address now, Mr. Chairman, where our R&D program is headed. I told you where we've come from, where we're going.

Let me first address the area specifically called for in the Aviation Safety Research Act of 1988 and I will then turn to some other areas of work which are needed if we are to successfully move into the 21st century.

What did the Act say?

The legislation gives the FAA specific goals for an R&D program. I believe we have made substantial progress in implementing the Act's provisions and I would like to highlight our activities to date.

It all begins with a plan. We submitted our plan for Research, Engineering, Development to Congress February 27th, 1989. The plan represents an initial step to work more closely with the aviation community. The plan incorporates the input from system users derived from an R&D conference held in November, '88.

Is it perfect? No, it's not.

Will it be better next year? Yes, it will.

It began as an FAA plan in '88. Today it's our plan and in 1990 there will be a national plan.

The FAA order establishing the Research Advisory Committee was approved and signed by the Administrator on January 10th, 1989. I'm pleased to announce that Mr. Bob Everett, currently Chairman of the Defense Science Board, has agreed to be Chairman of the Committee. We expect the Committee to have its first meeting in late May.

The subject of long-range research projects—the Act required that 15 percent of the FAA's R&D appropriation be used for long-term research, and we're in compliance with this requirement. Over 20 percent of the projects in the plan fall within the definition of long-term research.

The Act requires that FAA conduct research in a number of areas. FAA compliance is reflected in the wide range of research activities being conducted not only in-house, not only under contract to Mitre, Lincoln Labs, and other research organizations, but in the contracts and grants to universities, and through interagency agreements with NASA, DOD, the National Weather Service, and other government agencies.

Aircraft safety. The primary mission of aircraft safety: prevent an accident from happening. That's what it's all about. This is being addressed through our aging aircraft program, weather research program and collision avoidance program.

An example of our work in weather research is shown on a short video tape which describes the work being done in a Terminal Doppler, weather—Terminal Doppler Weather program.

[Film presentation.]

Mr. DEL BALZO. On the subject of aging aircraft, we initiated a National Aging Aircraft Research Program in early 1989. This is a multiyear effort consisting of research activities directed at the current and future needs of our fleet.

This plan is being drafted together with industry, universities, and other government agencies.

The short-term objectives of the plan will focus upon the identification and resolution of near-term issues relating to fatigue/multiple-site cracking, corrosion, nondestructive inspection, and human factors.

The future of long-term objectives of the National Aging Aircraft Research Program extends over and beyond the five-year period. It will focus on existing issues applicable to future airplane designs.

It is not just enough to know what's happening on an airplane today. What's critical is that we be able to predict problems in the future before they occur.

Collision avoidance. We're extremely pleased with the progress of our work in airborne collision avoidance.

The next video is a demonstration of TCAS III. And an introduction would tell you that the first view on this video is from the cockpit showing what the crew sees.

May I ask you to note that it takes over 20 seconds from the time that the video starts until the oncoming aircraft is observed by the crew.

The second view shows the TCAS display superimposed on the crew's view; the early detection capability of the TCAS III system becomes evident.

[Film presentation.]

Mr. DEL BALZO. Just about now.

[Film.]

Mr. DEL BALZO. Note how quickly the TCAS III picks up the oncoming aircraft. There's more than 20 seconds before it's observed visually.

[Film.]

Mr. DEL BALZO. I'm not sure you can hear it but if you listen carefully you will hear the TCAS monitor telling the pilot to descend.

[Film.]

Mr. DEL BALZO. The pilot takes no action so the TCAS monitor is now saying "turn right."

[Film.]

Mr. DEL BALZO. No matter how much we strive for zero accidents, the truth is there will always be the possibility of an accident.

The second part of our mission is to prevent and suppress in-flight and post-crash fires should an accident occur. We do this through our work in fire prevention in engines, in managing and containing fires away from the passengers, and reduce flammability materials, and fire retardation through water spray systems in continued efforts to reduce the flammability of fuel during a post-crash fire.

A major program initiated this year which will continue into the next fiscal year is the full-scale testing of an on-board cabin water mist system for presenting—for preventing—the spread of in-cabin fire.

The final line of defense is passenger evacuation. The research in this area includes work on emergency lighting, passenger protective breathing equipment, and escape chutes.

In the area of human factors/air safety, FAA will develop, we're committed to developing, a comprehensive national plan for human factors, not just an FAA plan.

This will require strong working relationships with all of the human factors centivex—"centers of excellence" and other government agencies, and industries, and in the academic community.

The coordination necessary both within the agency and with outside the groups will be accomplished through an internal Human Factors Coordinating Committee. That committee will report to four Executive Directors.

I am also happy to announce that Dr. Clay Foushee, formerly of NASA, with an international reputation, has been selected to fill the position of chairman of this committee. It has been in operation since January and they are in the process of completing a review of all current FAA human factors initiatives.

Dynamic simulation modeling. During 1989, the FAA initiated a project to develop an integrated model which connects en route and terminal airspace and airport environments. The model will have an interactive capability to allow us to evaluate air traffic control capacity problems. It will allow us to design and test new air traffic control procedures and identify and evaluate revised routes, waypoints and sector boundaries.

I planned to show two short video tapes on two models—two simulation models. You saw a demonstration of both of those models and we will skip the video tape.

The area of controller performance. Each project developing air traffic control automation techniques is structured to develop and evaluate the associated controller-machine interface. Each project uses a team of qualified controllers to participate in formulating requirements.

The key to our success in this area, in the human performance area, is the capability for a rapid prototyping laboratory where elements of the controller machine interface can be implemented quickly for evaluation. It saves a lot of time.

Another committee is interested in CAMI—Civil Aeronautic—Civil Aeromedical Research Institute. The FAA is under way in its planned efforts to rebuild CAMI, including the development of long-term capabilities in the areas of human factors research and additional research to address the various selection and training initiatives for the controller work force. Ongoing work includes study of human factors of aircraft inspection, maintenance and design, study of air carrier pilot training methods, and cockpit job task analysis.

Other research areas. Thus far I have focused primarily on our safety mission. Significant R&D work is being performed in other areas.

Let me take a minute to highlight just a couple.

Airport and system capacity. Our program to increase airport capacity continues to encourage municipalities, local governments, to establish new airports and additional runways at existing airports. Very, very difficult. It takes a long time.

FAA is conducting a number of programs designed to increase the capacity of existing airports. Introduction of new technology and new procedures in ways that will allow, for example, independ-

ent operations on runways separated by 4300 feet or more. There are additional airports with runways that are more closely spaced that currently have capacity restrictions. I believe we can make significant inroads in achieving increased capacity at those airports.[1]

Demonstration programs are already under way at Memphis and Raleigh-Durham.

Another approach which is available for later demonstration on one of the computer displays is for use with converging runways. Computer program developed by Mitre creates a ghost image showing the relative space in between aircraft on converging runways and allows us to more accurately space aircraft on final approach with an increase in capacity.

Air traffic control automation. The air traffic control system environment will continue to work on the Advanced Traffic Management System.

For the longer term control of the system, we are continuing our research in Automated En Route Air Traffic—AERA. AERA 3 is looking into the 21st century, when the automation system will take over completely the near-term tactical separation of aircraft. A significant element of the research program obviously must focus on the human factors impact on the controller as a system manager.

And, finally, aviation security. Our research and development program has as its objective the development of systems and devices which prevent or deter hijacking and sabotage. The emphasis has been on the development of capabilities to prevent the introduction of explosives and weapons onto the aircraft.

As I indicated earlier, Secretary Skinner has announced the requirements for installation of systems employing technology such as TNA. One such system is displayed in scale—quarter scale—on the table to my left.

The next video tape describes how the system works.

[Film presentation.]

Mr. DEL BALZO. A second effort in explosive detection has been the development of a vapor detection system for screening people. Since 1985, the FAA has had a fully funded program in development of a walk-in screening device for passengers. The initial prototype was completed, underwent laboratory testing in fiscal '88.

In October of 1988, the prototype was tested at Boston Logan Airport. And a final brief video describes this test.

[Film presentation.]

Mr. DEL BALZO. The system has potential and it also has its problems. It detects most explosives concealed under clothing but not the plastic explosives.

Mr. VALENTINE. Let me, Mr.—Mr. Del Balzo, let me—I hate to interrupt you, but——

Mr. DEL BALZO. Sure.

Mr. VALENTINE [continuing]. We have got to go, and we're a long way from where we vote. If you will please bear with us we have a

[1] The improvements would apply to spacings of less than 4300 feet.

quorum call and we have at least one vote and maybe a—two votes, at least.

Mr. DEL BALZO. Yes, sir.

Mr. VALENTINE. We'll be right back.

Mr. DEL BALZO. Thank you.

[Brief recess.]

Mr. VALENTINE. We're ready for you to begin again.

Mr. DEL BALZO. Mr. Chairman, thank you.

As I close, I would like to emphasize that over the last three years, as NAS Plan projects reach the implementation stage, the thrust of the R&D program has shifted from support of the NAS Plan to preparing us for the challenges of the 21st Century.

We expect to be dealing with new aircraft, new engine technology enabling aircraft to fly higher, faster and perform in different ways than today's conventional aircraft.

The air traffic control concept may very well move away from a ground based system of communication, navigation, surveillance, and automation, including artificial intelligence, might off-load some of the functions of the controller and the pilot.

Conventional two dimensional displays, manual data entry may give way to holographic 3-dimensional displays and voice entry techniques.

We are prepared to accept that challenge and continue to make the air transportation system in the United States the model for the rest of the world, and we look forward to the continued support of this subcommittee in our efforts to do just that.

Mr. Chairman, that concludes my prepared statement. And I am pleased to respond to any questions from the subcommittee at this time.

Thank you.

[The prepared statement of Mr. Del Balzo follows:]

STATEMENT OF JOSEPH M. DELBALZO, EXECUTIVE DIRECTOR FOR SYSTEM DEVELOPMENT, FEDERAL AVIATION ADMINISTRATION,BEFORE THE HOUSE COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY, SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS, CONCERNING THE FAA'S RESEARCH, ENGINEERING, AND DEVELOPMENT PROGRAMS. APRIL 12, 1989

Mr. Chairman and Members of the Subcommittee:

Thank you Mr. Chairman. Let me say at the outset how delighted I am to be here. This Committee has made significant contributions to our Agency over the years, and particularly so in the last year with the passage of the Aviation Safety Research Act of 1988. I know that you had hoped Secretary Skinner could be here today, but he is unable to do so and asked me to pass on his regrets. He asked that I be sure to tell you of his keen expectations for FAA research, engineering and development as a key element of the National Transportation Policy to which he is thoroughly committed.

The FAA appreciates the support this Subcommittee has provided for our efforts to restructure our R,E&D program. There have been many changes since we last met and I would like to provide you with a broad overview of our program, where we are today and where we hope to be in the near and distant future.

In the past decade, the air transportation system in the United States has undergone a massive transformation. The rigidly regulated system of airline routes and fares has given way to an economically deregulated system. Where at one time entry into a market could be denied for a variety of reasons, we now have a

system wherein airline management can enter and leave markets at will. This transformation of the air transportation system has resulted in significant changes. Some of the major changes influencing the air transportation system since fiscal year 1978, the last full fiscal year prior to deregulation, are summarized below.

The very nature of the commercial airline system has changed. Prior to deregulation the system consisted mainly of point to point routes between city pairs. At that time there were only a handful of airports that could be described as hub airports, where one or two airlines ran banks of aircraft. Today, there are approximately 35 hub airports in existence, each supporting one or two carrier hub-and-spoke route systems. Many of the passengers passing through these airports are doing so solely to catch a connecting flight to their final destination. Air carrier operations at the 35 hub airports have increased by 44 percent during the 10-year period.

The combination of increased consumer demand and the creation of hub airports resulted in system-wide increases in air traffic control system workload. Instrument operations at FAA towered airports increased by 32 percent over the decade. At our enroute traffic control centers the number of aircraft handled increased by 29 percent.

Concurrent with the increase in traffic, the level of delays also increased. Delays in the system increased by 34.5 percent between 1978 and 1987, growing from an average of 5.8 minutes per operation to 7.8 minutes per operation over that time period. Delay increases at the hub airports exceed the national average.

On the ground the congestion in and around the airports grew as the number of passengers enplaned in domestic flights grew by 68 percent. This has placed increased pressure on airport infrastructure and the interface between the airport and the off-airport road system.

A new threat against the safety of passengers emerged as international terrorists turned to attacks against civilian aircraft and their passengers. As systems to detect carry on weapons improved and became more effective and efficient, the threat turned from hijackings to bombings. Since mid-1982, there have been 16 incidents worldwide involving bombs and commercial aircraft, including the tragic bombing of Pan Am 103 over Lockabie, Scotland, on December 21, 1988.

All of these, and other forces, resulted in strains on the ability of the system of airports and airways to accommodate the new growth. FAA computers were running out of capacity to handle the workload. Vacuum tube based equipment was becoming more costly and difficult to repair and maintain. New aircraft, employing new

technologies with the ability to operate in more efficient ways, were entering the fleet. Some of the problems were foreseen, others were not. Nevertheless, when we recognized the problems one solution we turned to was technology. The R,E&D program of the 1960s and 1970s served as the basis for the National Airspace System Plan. The R,E&D program of the 1980s and 1990s must serve as the base to take us into the 21st century.

ACCOMPLISHMENTS

R,E&D funding of the new computer system for the En Route Air Traffic Control Centers (Host Computer) during the design and development phase led to the successful replacement, without any interruption in air traffic service, of the final old IBM 9020 computer in 1988.

Our record in the area of fire safety research is outstanding. Recent accomplishments as a result of the R,E&D program include the installation of aircraft seat cushions with a fire blocking layer in commercial jet aircraft. The seat cushion on which you sit when you fly is comfortable, yet will provide you with 40-60 seconds more time to escape the aircraft in case of a post fire crash. Last May an aircraft containing fire blocking cushions crashed on take off at Dallas/Ft. Worth International Airport. The aircraft was completely destroyed, yet 94 of 108 occupants survived. Our analysis shows that up to one-third of those who survived were

saved by the fire blocking cushions.

FAA's R,E&D program has provided the basis for a rule effective August 1990 requiring newly manufactured aircraft to be constructed with low smoke and heat release panels which will slow the spread of cabin fires and provide several additional minutes of time for escape. Other safety enhancements based on FAA research include an increased evacuation rate of 20 percent from floor proximity lighting, burn through resistant cargo liners, and a doubling of the amount of time evacuation slides retain pressure through heat resistant coatings.

With regard to explosives detection technology, last week Secretary Skinner announced that the FAA will require the deployment of explosives detection systems such as the Thermal Neutron Activation device at the busiest airports in the U.S. and overseas where U.S. airlines operate. The TNA system is the result of three years of FAA directed research into ways to detect all commercial and military explosives that might be concealed in checked baggage and air cargo, including normally hard-to-detect plastic explosives. TNA had a 95 percent effectiveness rate in detecting explosives and a low false alarm rate of four percent. The first TNA system will be deployed in June of this year at New York's John F. Kennedy International Airport.

Research in the traffic management area resulted in the development

of the aircraft situation display (ASD). This computer program enables air traffic to monitor all IFR aircraft flying in enroute controlled airspace. Last summer, the busiest time of the year, a runway was closed for needed repairs at Los Angeles International Airport. Normally this would have led to extended flight delays. Through the use of ASD to assist in traffic flow management, the expected delays did not occur.

These represent only a few of the products derived from past R,E&D efforts. Turning now to the future, we must consider the new challenges that face us in the 21st century.

FUTURE NAS ENVIRONMENT

Air traffic is expected to continue to grow as the economy flourishes and the demand for air travel expands. Indeed, over the next 20 years we expect passenger enplanements to more than double. To meet this demand the air carrier fleet will increase by over 60 percent and the resultant growth in operations will more than double the demand on FAA facilities. While these economic factors are at work, other factors will be influencing the air transportation system. The commercial jet aircraft fleet is aging and this trend is expected to continue. As the cost of new aircraft increases and delivery dates are pushed further out into the future, airlines are expected to retain and utilize existing aircraft longer.

Demographic changes in the work force will impact the system. The pilot work force is getting younger as older pilots retire and total demand increases. These newer pilots, on the other hand, will have grown up in a computerized environment. Similarly, the controller work force will also be undergoing a massive transition. Starting in 2001, thousands of controllers who were hired after the 1981 strike will be eligible for retirement, at about the same time that major changes to the air traffic control system are expected to become a reality. This work force is virtually automation dependent and is expected to be even more so as the current, prestrike controllers retire or leave the controller work force. This places an even higher premium on understanding the relationship between the work force and automation and the design of fail soft systems that allow time for appropriate human intervention.

Constraints on capacity expansion are expected to continue for the remainder of this decade as local concerns over the environment and the cost of new airport development continue to hamper the construction of new airports, or the expansion of existing airports, in or near major population centers. We need to use technology to provide optimal utilization of these resources.

The security threat is not expected to diminish. If anything, as our ability to detect weapons and explosives becomes demonstrably

more effective, terrorists will turn to other threats which must be anticipated and countered.

Finally there is the gradual evolution in the use of new materials and manufacturing processes being employed in aircraft construction. Fly by wire is a reality today that presents certification challenges and fly by light could become a reality during the next two decades. The FAA must develop new procedures for certification and inspection to enable the industry to achieve the full benefit potential for these materials and processes.

Just as we looked to technology over a decade ago, we must continue to look to technology to help prepare us to achieve the benefits of a strong and viable air transportation system well into the first decade of the 21st Century and beyond. To this end, the FAA has been restructuring both its organization and its R,E&D program to enable us to address the extant and emerging issues.

R,E&D PHILOSOPHY

Basic to all of FAA's efforts is the assumption that it is not technically, economically or logistically possible to achieve an overnight change in the air transportation system. We have not had in the past, nor do we expect to have in the future, any element of the system disappear one day to be completely replaced the next day. Thus, the fleet of aircraft that is handled by our air

traffic control system consists of aircraft produced in the 1940's, as well as aircraft produced today. The transition within air traffic control from the 9020 computer to the host computer took over a year to implement. The introduction of the sector suite, new radars, communication, and navigation equipment will all be phased in over several years. Thus, the first element of our R,E&D program is to develop more effective, efficient, and productive ways to use existing and soon to be installed new equipment.

The second area of effort is to find new and additional uses for the new equipment which will contribute to our missions of safety, capacity, security and efficiency. We will have invested billions of dollars in NAS capital equipment and software by the time the system modernization program is complete. It is imperative that we use these investments to their fullest potential before we start to replace them with the next generation of equipment.

The third area is to design the system of the future and to plan the transition to that system. This will require knowledge of new technology, materials, and processes, in order to fully understand and exploit alternative systems, procedures and operational concepts that these technologies allow and necessitate.

At this point Mr. Chairman, I would like to address where our R,E&D program is headed. I will first address the areas specifically called for in the Aviation Safety Research Act of 1988 and will

then turn to some other areas of work which are needed if we are to successfully move into the next century.

AVIATION SAFETY RESEARCH ACT OF 1988

The legislation gives the FAA specific goals for the R,E&D programs. We have made substantial progress in implementing the Act's provisions and I would like to highlight our efforts to date.

RESEARCH, ENGINEERING AND DEVELOPMENT PLAN

The FAA Plan for Research, Engineering and Development was submitted to Congress February 27, 1989. The plan represents an initial step to work more closely with the aviation community. The plan incorporates the input from system users derived from an R,E&D conference held in November, 1988. The plan introduces the concept of major mission area which will provide us a means of "top down" systems engineering planning of our research activities.

A major change that I initiated this year is the establishment of an R,E&D planning process. The objectives of the process are to: determine R,E&D requirements; establish priorities; allocate resources consistent with priorities; insure that system users both within and outside the FAA have an input into these decisions via the Administrator's Research Advisory Committee, the R,E&D Planning Conference, and FAA requirements working groups; and, monitor

program progress to assure accomplishment of agency goals. The results of this process will be reflected in next year's R,E&D Plan.

ADMINISTRATOR'S RESEARCH ADVISORY COMMITTEE

The FAA Order establishing the Research Advisory Committee was approved and signed by the Administrator on January, 10, 1989. Mr. Robert R. Everett, currently Chairman of the Defense Science Board has agreed to be Chairman of the Committee. We expect the Committee to have its first meeting in late May.

LONG RANGE RESEARCH PROJECTS

The Act required that 15% of the FAA's R,E&D appropriation be used for long term research. Long term research, as defined by the Act, means research projects which are unlikely to result in a final rulemaking action within 5 years, or in initial installation of equipment within 10 years, after the commencement of the project. FAA is in compliance with this requirement. Over 20 percent of the projects set forth in the plan fall within the definition of long term research. More importantly, in FY 1990 the FAA intends to focus even more on the longer term system needs. This should be reflected in next year's R,E&D Plan.

RESEARCH

The Act requires that FAA conduct research in a number of specific areas. FAA compliance is reflected in the wide range of research activities being conducted in-house, under contract to MITRE, Lincoln Labs, and other research organizations, including universities, and through inter-agency agreements with NASA, DOD, National Weather Service, and other government agencies. The programs discussed in the following sections reflect the major research projects. A complete description of every project is contained in Volume II of the R,E&D Plan.

AIRCRAFT SAFETY

The primary mission of the aircraft safety program is to prevent an accident from happening. This is being addressed through our aging aircraft, weather research and collision avoidance programs. The second part of the mission is to protect the passenger. This is accomplished through programs that assure that the aircraft is crashworthy. The third level mission is to prevent or suppress inflight and post-crash fires. This is addressed through our work in fire prevention in engines, in managing and containing fires away from the passengers, in reduced flammability materials, in fire retardation through water spray systems and continued efforts to reduce the flammability of fuel in post-crash fire. The final

line of defense is passenger evacuation. Research in this area includes work on emergency lighting, passenger protective breathing equipment and escape chutes.

AGING AIRCRAFT

Initiated in early 1989, the National Aging Aircraft Research Program is a multi-year effort consisting of research activities which will be directed at the current and future needs of the U.S. transport fleet. This program will support the development of new, or the revision of existing, regulations and advisory information. This approach will be geared to provide the maximum protection for aging airframe and engine structures against catastrophic fatigue and/or corrosion failures.

A National Aging Aircraft Research Program Plan is being drafted in concert with industry, academia, and other government agencies. The short term objectives of this plan will focus upon the identification and resolution of near term issues relating to fatigue/multiple-site cracking, corrosion, nondestructive inspection (NDI), and human factors. Surveys of existing systems and procedures used by both industry and government organizations will be undertaken followed by workshops and seminars to identify improvement needs. The basis for current regulatory/advisory material will be reviewed and provisions updated, accordingly. Expected benefits obtained from the current plan objectives will

be in the form of updated documentation for use by FAA and industry engineering, manufacturing, and maintenance personnel.

The future or long-term objectives of the National Aging Aircraft Research Program Plan extend over and beyond a five year period. It will focus on existing issues applicable to future airplane designs. Included tasks will provide for the explanation of failure mechanisms involved in aircraft fatigue and an evaluation of their detectability, predictability, and prevention means. New technology involving onboard monitoring/surveillance, advanced nondestructive inspection concepts and training techniques will be explored and implemented. In addition, efforts will be aimed at the development of a structural life management plan for application to future aircraft designs. Benefits from the long-term objectives will also be applied to the enhancement of engineering, manufacturing, and maintenance personnel capability through the development of the following:

o New advanced nondestructive inspection systems including robotics.

o New onboard monitoring systems and procedures for structural fatigue and corrosion detection.

o A "cradle-to-grave" aircraft structural integrity plan.

o An advanced damage tolerance handbook covering the inclusion of design (considering multi-site cracking) and maintenance/repair practices.

CRASHWORTHINESS

Crashworthiness is defined as the ability of the aircraft structure, interior, and furnishings to maintain an adequate survivable environment for passengers and crew in a crash occurrence. This technology is steadily evolving and the incentives for implementing new knowledge are rapidly increasing due to the realization that, despite earnest efforts to reduce or inhibit aircraft accidents, aircraft accidents will continue to occur.

The objectives of the crashworthiness/structural airworthiness program are to ensure continued airworthiness to preclude the occurrence of an accident and to reduce or prevent occupant injuries and fatalities should there be an accident.

During FY 1989/90 a series of full scale tests will be conducted to define the structural survivable envelope of a commuter airframe. The results of these tests will provide baseline data for composite airframes, upper limits for seat test criteria and cabin interior furnishings, fuel systems design, and ultimately data for regulatory consideration.

The results of these efforts will provide data to support regulatory criteria directed at commuter seat/restraint systems, commuter water ditching criteria, composite airframe structures,

and fuel systems design for all category aircraft.

PROPULSION FUEL SAFETY

Building upon work done in previous years, two tests will be conducted using a double-wall cylindrical tank (one of three fuselage fuel tank arrangements selected in an earlier concept review.) The purpose of these tests is to obtain dynamic responses and measured loads, accelerations and displacements resulting from a controlled crash. Tests are to evaluate the structural system including lines and fittings. The tests are scheduled to be completed in the first quarter of FY-90. Subsequently (FY90-FY92) the two other configurations are planned for testing under similar dynamic conditions. Based on an analysis of these tests, each system will be planned for upgrading for improved crash resistance including frangible fittings, self-sealing lines and/or penetration resistant bladders. In addition a test effort is planned for (FY-92) to address inboard wing fuel tanks lined fittings near the wing root.

Concurrent with the double wall cylindrical tank test another on-going effort addresses compartmentation. This is another approach to reduce the post-crash fire by controlling fuel release. An in-house investigation at the FAA's Technical Center has shown that significant benefit can be achieved by selectively compartmentizing wing fuel tanks during the landing and takeoff phases of an

operation.

A long term fuel containment effort (FY93-FY99) is planned to address the wing structure including such issues as wing bending loads and penetration of the wing structure including leading edge protection, front spar protection and crash resistant bladder cells, lines and breakaway fittings.

AIRCRAFT SYSTEMS FIRE SAFETY

The purpose of the Aircraft Systems Fire Safety Program is to develop means to minimize the likelihood of aircraft fire and to improve the chances for survival when fire does occur. Over the last two decades, the majority of fatalities involving U.S. carriers have involved post-crash fires with the fuselage cabin material fire being ignited by burning kerosene from the fuel tanks. However, the experience of foreign carriers shows in-flight fires to be a very real threat. The technical approach used in most elements of the fire safety program is to characterize a specific fire problem through full-scale fire tests and seek improvements through better materials, better fire management, or additional escape aids for the passengers. Full-scale tests are further used to quantify improvements made through material substitutions (e.g., fiberglass versus synthetics in certain applications). Such quantitative information is virtually a necessity if new fire safety regulations are to withstand the

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inevitable criticism that arises due to industry cost concerns. Finally, the full-scale test characterization data is used to select or develop surrogate laboratory tests that can be used in the day-to-day certification and quality control work conducted on all materials going into a production aircraft. It must be noted that correlation of these laboratory tests with full-scale tests and developing test repeatability among laboratories is often the most manpower intensive aspect of a specific fire safety research and development project. Additionally, the FAA has been involved with assisting foreign countries with the implementation of new fire tests.

We are continuing efforts to improve materials used in electrical wire insulation, aircraft acoustical insulation, and seat components other than the cushions. Also, the FAA has a Small Business Innovative Research project aimed at developing new aircraft materials that have flammability properties significantly better than those required by the latest rules.

Evaluation of data continues on the results of a major four year smoke evacuation program that culminated in late 1988 with flight tests of a modified B757 aircraft. Work was supported at the National Institute of Science and Technology to do scaled fire tests in enclosures that had ventilation patterns similar to aircraft in flight. Full-scale test work will be completed later this year on aircraft fuselage burn through from external 400

square foot fuel fires. The test fuselages are configured with either landing gear retracted or extended to determine the manner in which the fire can breach the hull. The test results will be analyzed to see if improvements are feasible or warranted.

Work is underway on full-scale testing of an onboard cabin water mist system. The initial testing involves use of British developed water mist nozzles. Although the system showed promise in some limited testing in England, the objective of the FAA tests is to evaluate the system under more controlled and repeatable test conditions. The overall cabin water mist effort is being sponsored by FAA, British, and Canadian civil aviation authorities.

Additional in-flight fire safety work involves hidden fires. This includes arc-tracking of wires and the effects of wire shorts on aircraft insulation bagging material. Also related to this is work on the relation of cabin pressure to material ignitability and burning rate.

A major longer range effort involves a system that would employ state-of-the-art aircraft computer capability to provide more accurate and timely guidance to the flight deck crew in the event of an in-flight fire emergency. A technology assessment was completed in 1988, and a design study effort is underway. Given a positive result from the design study, a prototype system should be available for fire tests in 1991.

Overall, our fire safety efforts have been moving away from passive fire protection efforts to ones that involve active fire protection, while new rules have made the aircraft intrinsically safer in their construction materials.

HUMAN FACTORS/AIR SAFETY

Since human performance concerns are central to all of the FAA's primary responsibilities, an organizational commitment has been made to manage and coordinate the development of the national aviation human factors research program at the highest levels of the agency. In addition, FAA will develop a comprehensive national plan for human factors, not just an FAA plan. This will require strong working relationships with all of the human factors "centers of excellence" in other government agencies, in industry, and in the academic community.

The coordination necessary both within the agency and with outside groups will be accomplished the newly-created Human Factors Coordinating Committee (HFCC) which reports to the Executive Directors of the FAA. Each of the Executive Directors has designated one permanent representative to the HFCC and the committee is chaired by the Chief, Scientific and Technical Advisor for Human Factors. This is a new scientific position created specifically as a focal point for human factors initiatives within the agency. H. Clayton Foushee, formerly of NASA, has been

selected to fill this position.

The HFCC has been in operation since January and has completed a review of all current FAA human factors initiatives and the recommendations of an Air Transport Association sponsored Human Factors Task Force. The next step is to develop a new agreement between FAA and NASA to jointly pursue development of the national plan.

DYNAMIC SIMULATION MODELING

During FY 1989 the FAA initiated a project to develop an integrated model which connects enroute and terminal airspace and airport environments. The model will have interactive capability to: evaluate air traffic control capacity problems; design and test new air traffic control procedures; and, identify and evaluate revised routes, waypoints and sector boundaries.

The initial effort will focus on design and performance evaluation of enroute sector airspace. Once the initial sector simulation is successful, the next level efforts will be to link sectors to simulate centers and then to link centers together to form the enroute airspace.

Logic from other existing simulation models will be incorporated into the model to capture terminal airspace and airport

environments. When completed the model will compute air traffic control workload, aircraft conflict probabilities, aircraft fuel burn, flight time, operating costs, enroute/terminal capacity limitations and aircraft delay.

CONTROLLER PERFORMANCE

Each project developing air traffic control automation techniques is structured to develop and evaluate the associated controller-machine interface. Each project uses a team of qualified controllers who participate in formulating system requirements, in developing the system design and evaluating the associated man-machine interface. Each project uses, or, when appropriate, will use, a rapid prototyping laboratory where elements of the controller machine interface design can be implemented quickly for evaluation. This process assures that the automation products will be developed with adequate consideration for the controller human factors aspects.

CIVIL AEROMEDICAL RESEARCH/CAMI

The FAA is underway in its planned efforts to rebuild CAMI, including the development of longer term capabilities in the areas of human factors research and additional research to address the various selection and training initiatives for the controller work force in an increasingly automated environment. Ongoing work

includes: study of human factors of aircraft inspection, maintenance and design; study of air carrier pilot training methods; and, cockpit job task analysis.

CAMI maintains the primary knowledge base and research capacity within the FAA to address aviation medicine and medical aspects of human factors problems. Through more active participation in the research requirements process CAMI is expected to play a major role in the overall agency R,E&D program.

WEATHER

FAA's R,E&D weather research program complements the NAS Plan with an emphasis on improving weather services. These programs are designed to provide controllers and pilots with information on both routine weather and severe weather that can be hazardous to aviation operations. The FAA is sponsoring the development of a terminal Doppler weather radar which is specifically designed to detect the microburst weather hazard. This weather phenomena can occur in nearly clear weather with a few clouds overhead or in severe thunderstorms. Several major fatal air carrier accidents have been attributed to microburst induced loss of control. This past summer a prototype terminal Doppler weather radar being used for data collection near Denver Stapleton Airport accurately detected a severe 80- knot microburst on the final approach course to one runway. Advisories issued to pilots resulted in five

aircraft executing missed approaches. One pilot reported that the warning may well have saved that particular flight.

During FY 1990 testing of the terminal Doppler radar will continue at different airports with different environments to determine the ability of the system to detect micro-bursts under differing climatic conditions.

OTHER RESEARCH AREAS

Thus far I have been focusing on our safety mission. Significant R,E&D work is being performed in support of the other mission areas, capacity, security and efficiency, and I will highlight some of these programs.

AIRPORT/SYSTEM CAPACITY

Our program to increase airport capacity continues to encourage municipalities to establish new airports and additional runways at existing airports. Since these improvements take many years to accomplish, the FAA is conducting a number of programs designed to increase the capacity of existing airports. Many airports are equipped with parallel runways and current procedures allow independent operations on runways separated by 4,300 feet or more. There are additional airports with runways that are more closely spaced that currently have capacity restrictions since the two

parallel runways must operate as if they were a single runway (dependent operations.) Demonstration programs at Memphis, Tennessee, and Raleigh-Durham, North Carolina, are investigating the use of precision surveillance systems to permit independent parallel operations down to separations of 3,500 feet, with further testing to see if this can be used to provide separation down to 2500 feet.

The FAA is actively supporting the efforts of locally oriented airport capacity enhancement task forces. Using simulation modeling support from the Technical Center, local airport, FAA, industry and community representatives evaluate options which could enhance capacity. These dynamic simulation models are being continuously upgraded and refined.

During the coming year FAA will be investigating various terminal automation programs which would provide better and more timely information to controllers, thereby permitting them to employ more efficient control techniques in the terminal area. In FY 1989 the focus of the Terminal ATC Automation project was to develop system designs for dynamic traffic planning, traffic sequencing, and aircraft speed advisory capabilities. In FY 1990 these individual capabilities will be integrated and evaluated in a real time simulation.

AIR TRAFFIC CONTROL AUTOMATION

In the air traffic control system environment we will continue work on the Advanced Traffic Management System (ATMS). ATMS will link terminal, en route, and national traffic management functions to enhance traffic management capabilities and provide more precise information to system operators and users regarding current and projected airspace system traffic, delay, and congestion conditions. ATMS will provide Air Traffic with the tools that are needed to more efficiently and effectively use the national airspace.

For the longer term we are continuing our research in Automated En Route Air Traffic (AERA 3). AERA 3 is looking into the 21st century, when the automation system will take over completely the near-term tactical separation of aircraft. AERA 3 software will automatically detect problems, determine resolution, and generate appropriate clearances and transmit via data link to involved aircraft. A significant element of the research program will be the human factors impact on the controller as a system manager.

AVIATION SECURITY

Our research and development program in aviation security has as its objective the development of systems and devices which prevent or deter hijacking and sabotage against civil aviation. The

emphasis of the program has been on development of capabilities to prevent the introduction of explosives and weapons onto the aircraft.

The development of systems to detect concealed explosives in carry-on, checked baggage, air cargo, and on people has been the focal point of our research and development. This program area has included a mix of near-term hardware development of proven technologies and longer term feasibility studies on new concepts and emerging technologies. The FAA program in explosives detection has had three parallel efforts. The first has been the development of a thermal neutron activation (TNA) system for screening checked baggage and cargo. TNA prototypes have been successfully developed, tested, and evaluated, and are the first, true explosive detectors. They identify explosives on the basis of their nitrogen content.

The FAA plans to purchase six TNA systems together with special X-ray units, with delivery on an accelerated basis. The accelerated schedule requires that all six systems have radioisotopic rather than electronic neutron sources. In addition, the X-ray and TNA systems will act together as a "dual sensor" system, with image data from each being correlated and analyzed by a single, controlling computer.

The second effort in explosive detection has been the development

of a vapor detection system for screening people. Since 1985, the FAA has had a fully funded program in development of a walk-in screening system for passengers. The initial prototype was completed and underwent laboratory testing in FY-1988. In October 1988, the prototype was tested at Boston Logan Airport. Results to date show that the prototype reliably detects most explosives concealed under clothing, but not the plastic explosives now being used by terrorists. Its average screening time is also unacceptably long - 40 seconds per person. For this reason, the walk-in system will undergo another iteration of development in an effort to improve its sensitivity and reduce its screening time. The prototype will be retested at an airport in mid-1990. The interim product is the most sensitive vapor detector yet seen, the chemiluminescent system

The third effort has been the identification of new concepts and technologies applicable to explosives detection. A number of multi-phased projects, beginning with feasibility demonstrations, have been underway with the purpose of developing in the longer term the next generation of detection systems. Several technologies have now been identified which seem to offer significant advantages over current systems in efficiency, effectiveness, and/or cost. The most successful thus far has been the dual sensor project, whose results are being exploited in the FAA deployed systems. Other technologies have shown great promise, including biotechnology and resonant gamma ray absorption.

We are also exploring a number of new initiatives which are being pursued with greater urgency. In cooperation with U.S. manufacturers of electric blasting caps, an investigation on methods to make such caps readily detectable has been completed. A suitable magnetic additive has been identified and a prototype system to detect the additive in baggage will be completed in FY-1990.

Feasibility studies on detection of flammables and explosive liquids in carry-on are underway. An extensive evaluation of commercial metal detectors will be completed by the end of FY-1989. Finally, active millimeter wave imaging has been identified as a means of screening people for "plastic" weapons and a prototype detector is now under development.

Another recent initiative involves the demonstration of an enhanced, integrated security system at Baltimore-Washington International Airport. The demonstration will focus on the design and implementation of a security system that provides effective balance among the major security functions, permanent protection against a higher level threat, and contingency measures for protection against a terrorist level threat. Operational and economic cost/benefit data will be collected during the demonstration of the system and can be made available for distribution to interested parties, both government and industry.

The program's technical efforts have been fully coordinated with Departments of State, Defense, and Energy and law enforcement and intelligence agencies. International working agreements are in place with several foreign governments. Technical project efforts have included several Small Business Innovative Research grants; work with major universities such as Massachusetts Institute of Technology, Carnegie Mellon, Washington State University, and the University of California at Los Angeles; and studies at historically black universities including Fisk and North Carolina A&T. The National Academy of Sciences is under contract to the FAA to assess the Security Program's past and current efforts, and will issue a detailed report of its findings in FY-1990.

SUMMARY

In closing, Mr. Chairman, I would like to emphasize that over the last three years, as NAS plan projects reached the implementation stage, the thrust of the R,E&D program has shifted from support of the NAS Plan to preparing us for the challenges of the 21st century. We expect to be dealing with new aircraft/engine technology enabling aircraft to fly higher, faster and perform in different ways than today's conventional aircraft. The air traffic control concept may very well move away from a ground based system of communication, navigation and surveillance. Automation, including artificial intelligence, might off-load some of the

functions of the controller and the pilot. Conventional two dimensional displays and manual data entry may give way to holographic 3-dimensional displays and voice entry techniques.

We are prepared to accept that challenge and continue to make the air transportation system in the United States the model for the rest of the world, and we look forward to the continued support of this subcommittee in our efforts to do so..

This concludes my prepared statement, Mr. Chairman. I would be pleased to respond to any questions from the Subcommittee at this time.

Mr. VALENTINE. Thank you, sir.

You have listed significant accomplishments and cause for—for pride in all of us. But let me ask you this question.

If the FAA had the additional 82 million, which was authorized by Congress for FY 1990, what, in your opinion, could be accomplished? How would it be utilized?

Mr. DEL BALZO. Congressman, I think we could do a lot. There's no question that to a certain point the more you have, the more you can do.

And if I were to ask myself where we would put additional money in FY '90, there's no question that we would use it in the area of aviation security, research and development. I believe that we could make further inroads with TNA sensor technology. I believe that we could expand and accelerate work on vapor detectors and liquid explosive detection. I believe that we could investigate new technology in antigen anti-body detectors, gamma ray source in detector designs, and wave production systems.

I believe that we could make significant contributions in aging aircraft research. We can expand the data base for multiple site cracking. I believe that we can investigate new methods for detecting cracks in dis-bonding, make significant inroads in corrosion prediction and detection in prevention, and actually establish a cradle-to-grave structural integrity procedure, and the list goes on.

I believe that we could make and accelerate substantial progress in civil aviation application of GPS. We could accelerate the time when civil aviation can take advantage of GPS potential. And we don't have to wait until the late 1990s.

In the area of terminal automation, significant achievements can be had. We can provide acceleration of the implementation of terminal ATC automation and airport surface traffic automation. We can accelerate implementation of data link services in the terminal area.

And, finally, I think we can establish a transition program for TCAS, as requested by Congress, to resolve implementation questions early related to training, operational procedures, and correct logic.

Mr. VALENTINE. We invited Secretary Skinner to come and testify—come talk to us. We were told he was not able to do that. He had commitments, I believe, overseas. We, through staff, invited his office to submit a statement to us, and they declined to do that, saying, I believe, that there was no precedent for it.

It seems to me that if there were no precedent, that if I were in his position, maybe I would want to try to set one. I—I don't—we don't read it anything into that. I mean, we don't read any—anything uncomplimentary. We look forward to his service and a tenure of cooperation. But I—the reason I say that and what I'm leading up to is this: Do—could you speculate for us, or could you give us the benefit of your judgment—judgment as to whether or not Mr. Skinner will be, shall we say, more sensitive to the needs of aviation—aviation research and development than have been some of his predecessors?

Mr. DEL BALZO. Mr. Chairman, I think I can, based on firsthand discussions that I've had with the Secretary. And I think if he were here today and you were—and you were to ask him the question:

What's the single most important criteria for success in terms of having a dynamic air transportation system tomorrow to meet the requirements of the 21st century?

He would probably say something like the introduction, the timely introduction of new technology in a way that can make a difference. I believe that he feels very strongly about that. I believe that you will have the same sense in your discussions with him.

Mr. VALENTINE. It's our understanding that one of the budget decisions which the FAA had to make to accommodate the 47 million funding cuts ordered by DOT, or OMB, or—was to reduce the funding for the testing of the precision radar system at Raleigh-Durham International Airport, which—in which, of course, I have some slight parochial interest. By—decrease that by about $3 million.

Can you tell us what, in your opinion, the impact of that cut would be on that, I think obviously very—very valuable use—and useful testing program.

Mr. DEL BALZO. I don't remember the exact numbers, Mr. Chairman, but I do recall that we did reduce the testing budget for the system at Raleigh-Durham.

But the good news is that we ensured that there were adequate resources that were left in the program so that we could complete the required test program. And it is our intention, and I commit to you today that we will have an operational capability at Raleigh-Durham in 1991.

Mr. VALENTINE. In last year's oversight hearing, the Administrator, Mr. McArtor, referred to his new management and control organization as a R&D czar. Briefings in—to the subcommittee staff convinced staff people that a—a structure was indeed being put in place that would ensure a corporate discipline in the R&D process.

Can you—can you give us any assurances that when the internal turf wars break out that management and control process will have full management support and not be downgraded in—in some manner?

Mr. DEL BALZO. Mr. Chairman, I believe I can do that. I believe that you're aware that the existing structure within the Federal Aviation Administration revolves around four Executive Directors that report directly to the Administrator. I'm one of those Executive Directors.

I can give you my personal assurance that as long as I am the Executive Director, our management and control organization will have full support to fully implement our R&D program, of yours and mine.

Mr. VALENTINE. Can you give us a little more detail as to how the management and control process would operate—operate to achieve the corporate position and fix project priorities, and so on?

Mr. DEL BALZO. The key to achieving a corporate position in an R&D program in our organization—if I had to give an analogy it would be operating in a fish bowl with everyone participating horizontally across organizations.

We are attempting to do that through the establishment of what we call an Interservice Working Group with representation from not just the R&D community but the line organizations as well.

I think you will find that to be an extremely effective process to allow us to establish R&D priorities and a true commitment to move from R&D into implementation from the operating services.

Mr. VALENTINE. We have to leave again. I—I know you guys and ladies would like to go with us but if we don't get lost we'll be back in a few minutes, if we don't get waylaid. Please bear with us. I do feel apologetic, but you know, they pay us to vote, don't they?

Mr. DEL BALZO. Yes, sir.

[Brief recess.]

Mr. VALENTINE. We will get back to work, if you will find some seats, please.

One of the RE&D plans—planned—projects is called the, as you know, the Management and Control Process. This would be expected to be in—an internal management function with minimal contractual support—or contract support.

The requested funding for FY 1990 is $4.8 million. Of the 96 R&D projects, only eight have a high—higher level of funding.

Is this an appropriate and necessary level of funding or—or can the project objectives be achieved in some—in some other, or different, or less expensive way?

Mr. DEL BALZO. Mr. Chairman, I think the level is appropriate. I listened very carefully to the GAO report. And if you recall, the deficiencies that they cited in our R&D program had to do with the specificity of cost information, the fact that we did not identify exactly long-term research projects.

The problem with resource utilization, and our inability to talk about where resources were being applied, and the lack of historical data. And in all honesty, the lack of a management control function that provides management information of the right kind that we can actually manage an aggressive R&D program.

I don't know a way to establish that capability any cheaper than the number that we have estimated.

I think in the future that number will certainly come down, but we had to start somewhere.

Mr. VALENTINE. Since the airline and aircraft manufacturing industry—or industries—have a major interest, of course, in—in research surrounding aircraft airworthiness, crashworthiness, aging—the phases of the aging aircraft—et cetera, what can you tell us about the—about your opinion as to the degree that these industries are—are sharing in the costs which are associated with research and—or to what extent they should participate?

Mr. DEL BALZO. I don't think there's any question that industry is committing a significant amount of IR&D funding within their own organizations, and they're improving areas of safety. As you know, when industry commits R&D funding—IR&D funding—is paid for in part by the government. And in return for that, the resulting information and data are in fact being provided to FAA.

So we have access to the data that comes out of industry-funded IR&D programs.

Mr. VALENTINE. I had the privilege about 10 days ago, I guess, of visiting the FA—FAA facility at Atlantic City, which is very impressive. I wish that more people in and out of Congress would have the opportunity to view that facility and see what goes on there.

There was one demonstration that I wanted to ask you some questions about, that in a way one wonders why it wasn't thought up long ago. But this was the system involving the sprinklers on an airplane to control fire. And I can understand how that system would operate if an on-board or in-cabin fire—if that's the right terminology—occurred in-flight.

What I'm having trouble comprehending is how—and I understood that the system was—was—there was some expectation that it would be useful involving a—a crash—is how that system could ever be fixed so that it wouldn't be completely torn apart by a crash.

Mr. DEL BALZO. The system that we're evaluating now is based upon many years of research. This is not the first time that we have evaluated the potential of a water system contained on the aircraft to help put out a post-crash fire.

The original testing that we did was done with nozzles that almost look like a showerhead, did not put out a very fine mist, so the water came out very rapidly and dissipated very rapidly, and would—it never lasted long enough to have any long-term effect on dousing a fire.

The nozzles that are now being used put out a very, very fine mist. And we learned—we learned—we learned from our anti-misting program, which many people say was a failure; I don't believe it was a failure because we did learn a lot. Different kind of nozzles that are now being used put out a very fine mist that allows us to get much more per volume of water. We're very encouraged with the—with the early results that we're getting from that program.

The question you asked, however, is the right question. Given that it works, how do you ensure that it will be crashworthy and have the system actually survive the crash itself?

I don't know the answer to that yet.

Mr. VALENTINE. You—I think it's probably common knowledge that you have no—no authority—the FAA—to issue research grants to universities.

Can you give us the—if there is one—the rationale behind that? And what do you think should be done about it? And the extent to which the FAA has a link or an arrangement with the universities and colleges in this country?

Mr. DEL BALZO. Mr. Chairman, it's true. FAA does not have the authority to issue research grants to universities.

An agency can make grants only with express legislative authority to do so. NASA, for example, has specific legislative authority to make grants to universities. The only legislative authority that we have to enter into grants are under the Airport Improvement Program and under the Airway Science Program. Everything else that we do with universities, we do competitively and we look at a university no differently than we look at any other institution and any other corporation—we do it competitively.

There are many times, particularly in the areas of long-term research, where I believe that it would be to our advantage if that capability did exist. It would make it easier.

Mr. VALENTINE. Can you give us a little more information as to what you mean by dealing with them competitively, and tell us also if you—if you think it would be useful for the FAA to have the

same authority that NASA has to deal directly with universities in the country? And if so, how would you do it, other than competitively?

Mr. DEL BALZO. What we do today is where we have a university that has—that has a particular expertise that we would like to take advantage of; and in fact we have done this several times—we're doing it today—we're doing it through a joint program with NASA.

We have a number of universities that are joined together—MIT, Ohio University; there are one or two other—Princeton University. And we will submit our requirements and fund our requirements to those universities through NASA where the legislative authority exists.

If we did not have that vehicle, we would be required to develop a work statement, develop a set of requirements, advertise those requirements as we would any other competitive procurement, and universities would be free to compete either with other universities or with industry that would care to enter into the competition.

Mr. VALENTINE. Are you telling us that the arrangement that now exists between FAA and NASA is a satisfactory arrangement, or would—would your—would the—your agency be more useful, or would it be a more useful expenditure of public funds if you could do as NASA does and—and deal directly on some satisfactory basis with universities?

Mr. DEL BALZO. I don't think there's any question that the more that we can do to streamline procurement regulations—and that's a broader question than just the university grant authority—anything that we can do to streamline the procurement process and expedite or accelerate an acquisition process has to be to our advantage.

Mr. VALENTINE. The revolutionary devices which have been demonstrated—which have been described to us here by—by you, and demonstrated with the—on the screen there.

To what extent were those technologies perfected by research and development money paid by the taxpayers?

Mr. DEL BALZO. Mr. Chairman, I can't quote the exact figure, and certainly would be happy to provide that for the record. That technology was certainly developed in industry. We sponsored the refinement of an existing technology that was presented to us from the industry. And I will be happy to—to provide you with the level of funding that took us from where that technology was to where it is today.

[The information follows:]

R,E&D OBLIGATIONS

[Dollars in thousands]

Fiscal year	ASD	TCAS	Chemi-luminescent portal system	TDWR	TNA dual sensor system
1981		759			
1982		9,534			
1983		8,616			
1984		9,111	150	1,908	
1985	1,690	10,829	1,200	60	4,700

R,E&D OBLIGATIONS—Continued

[Dollars in thousands]

Fiscal year	ASD	TCAS	Chemi-luminescent portal system	TDWR	TNA dual sensor system
1986	1,400	8,063	1,700	.....	4,500
1987	2,063	6,644	1,500	2,154	4,100
1988	1,957	9,433	600	510	1,900
Subtotal	7,110	62,989	5,150	4,632	15,200
1989 planned obligations	.....	15,069	450	1,338	600
Total	7,110	78,058	5,600	5,970	15,800

Mr. VALENTINE. You discuss aging aircraft research as having a near—as having near-term object—objectives—for updating and refining regulations and documentation in—in the first place.

And in the second place, long-term objectives of new monitoring, inspection, and design technologies for future aircraft designs.

Does this project address technology developments to enhance the monitoring, inspection, and detection of structural weaknesses for the aircraft that we ride in today?

You know, we are all concerned about the future technologies but the—we—there are a lot of—of us who are concerned about the—the shape of the airplanes that we will go home in later on this week. And if you could tell us something about that.

Mr. DEL BALZO. Yes, Mr. Chairman, when we developed our Aging Aircraft R&D program, our initial focus was on near term; what it is that we can do in the near term with today's fleet that could focus on improving the monitoring, inspection, and detection of structural weaknesses in the current fleet of aircraft.

And in so doing, we attempted to have a balanced program that in addition to just looking at the fleet of today, also to be able to predict problems that would happen in the fleet of tomorrow before they would occur. But in fact the primary focus in our program and the early results will apply to the existing fleet.

Mr. VALENTINE. Are there emerging technologies within the knowledge of FAA that could make significant advancements—achievements—in this area today if funding was available? Could you do a better job with more money?

Mr. DEL BALZO. I think this is an area that if we had additional funding that we would put additional funding into. There are some emerging technologies that are being investigated and pursued by NASA. We have a joint program with NASA on advanced technologies in this area, and that's an area that we would certainly accelerate.

Mr. VALENTINE. Does the FAA consider its air traffic controllers to be human factor experts?

Mr. DEL BALZO. No, we don't. What air traffic controllers bring to any R&D program is real world experience—what you can do and what you can't do; what will work and what won't work in the real world.

There's a difference between what appears to work on paper and what air traffic controllers can actually interface with in an oper-

ational environment. So we—we work very carefully to bring air traffic controllers into the evaluation process leading up to a final design early in the design stages.

Mr. VALENTINE. Will this human factors czar that we've talked about here today and that high level group, which is discussed, be actively involved in analyzing the long-term human factor impacts of the ATC Automation projects?

Mr. DEL BALZO. No question. As we look at tomorrow, as we look at higher levels of automation in the world of air traffic control, and we look at technologies like AERA 3, it's very important that we understand the right balance between the controller and the machine to ensure that we design a system that allows controllers to do what they do best and the machine to do what the machine does best.

Mr. VALENTINE. A previous witness described the ATC process as a collection of functions, that is, flow control, en route, terminal, and airport surface ATC acting as a single system.

Is the FAA approaching the development of the identical ATC Automation projects with that same sense of system?

Mr. DEL BALZO. Probably not as well as we should have. I think it's something that we now recognize as a must. When we look at the automated world of air traffic control tomorrow, we now believe that the demarcation between en route air traffic control, and terminal air traffic control, and approach air traffic control gets very fuzzy and much less clear than that demarcation is today.

We don't believe that there's any choice when you talk about an automated system of tomorrow to talk about an air traffic control system and not discrete pieces of the system.

Mr. VALENTINE. Can you describe for us briefly the—the process by which the individual ATC projects are coordinated to achieve this single system concept?

Mr. DEL BALZO. We're doing several things. In terms of system capacity, we have established a FAA Coordinating Committee made up of the operational side of the agency along with the R&D side and the acquisition side to ensure that we don't wind up with $15 billion worth of new technology from the NAS Plan, but nothing changes; to ensure that we use the technology in a way that will increase both system capacity and system safety and increase productivity. And the only way that you can do that is to integrate the different pieces of new technology into a single integrated system.

Mr. VALENTINE. Why is the flow management automation research project not in the research organization performing the en route, terminal, and airport surface automation developments?

Mr. DEL BALZO. One of the things that we've learned through the years—I heard someone talk about a cultural change. There's a peculiar culture; there's a culture that's peculiar to every organization. There's a culture peculiar to our organization that says if you would like the operational services to own the product that comes from an R&D program, the more responsibility that you can put on that organization, the more likely it is that they will own and support the introduction of the new technology.

So wherever we can, we try to ensure that requirements are set, and actually almost managed, by the line organization where it

makes sense. We're doing that in the human factors area, we do it in the airport system capacity area, and we do that in the flow management activity as well.

Mr. VALENTINE. Does the FAA plan to aggressively explore new technologies for the training of the many high—highly technical skills required by the FAA?

Mr. DEL BALZO. I don't think we have a choice. We don't have a choice except to in fact be committed to almost stay on the leading edge of training technologies. It doesn't do us very much good if we introduce all kinds of new technologies and all kinds of displays and new input/output devices, and change procedures that the ATC world of tomorrow and how we manage the airspace is different than it is today if we continue to hire the same kinds of people and train them the same kinds of way that we do today. Tomorrow's system requires different kinds of people and we also have to train them differently than we're doing today with advanced techniques; so the answer is yes.

Mr. VALENTINE. With respect to the advanced aviation system design, which was meant to serve as a—as a base line for discussions on the future of the national global aviation system, what's the status of that—of that concept document?

Mr. DEL BALZO. Two years ago we recognized the need to begin looking ahead to what would be needed in the 21st century, conceptually. We put together a very small talented team to address that question. A couple of months ago they finished their work and produced the product—number of volumes of detailed work—a video tape that describes an air traffic control concept as the world could be in the year 2010 or 2020—the time's not important.

That is in the coordination stages now, both within FAA and when—in—in the Office of Secretary. Our intention is to take that work and build upon it and use it to start a series of—serious discussions with the user community, with industry, and with the international community.

Mr. VALENTINE. Does the organization have a project that is examining the feasibility of the multitude of the advanced concepts, that is, such as wayports, which are often discussed at meeting of aviation people?

Mr. DEL BALZO. Wayports is a—it's an attractive concept of today that is worth looking at and needs a lot of attention. It comes with a lot of concerns. People will tell you that—the industry will tell you that they're concerned about how do we finance a wayport? Who would pay for it?

And if you don't have origin and destination traffic, could it ever pay for itself? Would it ever be able to generate enough revenue to pay for itself? So there are a lot of concerns that need to be studied.

We are in the process of doing just that. We have an internal airport working group that is looking at that concept and will be interfacing with the industry, addressing those issues over the next six months.

Mr. VALENTINE. How do you see the FAA—and I'm almost finished—how do you see the organization's role in promoting the tilt wing rotorcraft vehicles?

And, finally, do you see the development of that type of aircraft as a—something of a different, separate, ancillary system where the machines would move from their own separate ports, foundations, to other landing places, at other—or would they move from regular airports and—and travel in the channels that are used by commercial airliners today?

Mr. DEL BALZO. Mr. Chairman, I think the answer to that question is, yes, both. I believe that based on the studies that we have done ourselves, that we have funded, and the work that has been done by the industry, both the airports, or some several airports organization, and the airframe manufacturers.

I believe that the potential application of a tilt rotor vehicle in air trans—particularly short haul—in an air transportation system of tomorrow are just exciting. That, too, does not come without its problems.

There are economic problems, whether or not it could ever pay for itself. But in the short haul market, one can't help but be excited about the potential addition in capacity that you could create. For example, New York-Washington, New York-Boston, downtown New York, downtown Washington, in 45 minutes.

It is certainly something that we need to pursue to discern whether or not it does have a place in civil aviation. I think we just don't know that yet.

Mr. VALENTINE. Is the technology such that these vehicles would be capable of carrying large numbers of passengers—a hundred, or 200, or something of that kind?

Mr. DEL BALZO. If you look at the military development program—and the program that we have embarked upon is one that will allow us to parallel what the military's doing so that we can have parallel certification.

So if you look at the existing military technology you'll probably be talking a vehicle that can carry, I would say, 40 to 50 passengers. The technology is capable, with the existing engines, I believe of maybe raising that number to 60 to 70. When you talk about more than 70 passengers, I think you're talking about new engines and technology development.

Mr. VALENTINE. Almost every witness at these hearings has voiced a—a concern about the problem of runway incursions. Admiral Engen, back in 1987, stated that there is a need to develop an automated runway incursion alert.

What is the status of the FAA's project to deal with this problem?

Mr. DEL BALZO. We're attacking that problem on two separate fronts. You recall that we do have a production procurement for a new generation—airport surface detection radar—first delivery of the production system will be in Pittsburgh later on this year. There are two companies that have developed, again, with their own company funds, a technique that—a software technique—that will—that will alert controllers to potential runway incursions before they occur.

Deficiency with that technique is it does not do anything in terms of runway—aircraft identification; still worth pursuing, particularly if it can be done easily, cheaply, and quickly.

Our intention now, and we're in the process of writing a work statement, is to choose one of those two—two companies to further develop the technique to the point where we can do an operational evaluation.

In addition to that, the longer term solution to the runway incursion problem is a solution based upon aircraft identification so that we can handle aircraft on the runway the same way we handle aircraft in the airspace.

Mr. VALENTINE. Mr. Lewis?

Mr. LEWIS. Thank you, Mr. Chairman.

Mr. Del Balzo, I have great admiration for you and for the FAA. In so many ways with so many things on your plate, I don't know how you take care of them all. But I do want to ask you a few questions that I also asked the GAO in response to some of their things; you may or may not be able to answer all of these.

But you recall that the FAA issued—in the GAO testimony that they stated the FAA issued the latest plan without the requisite project costs and staffing information.

Now, does the FAA have project costs and staffing information for the FAA administration plan for research, engineering, and development?

Mr. DEL BALZO. We have project costs. We certainly have project estimates and schedule estimates. And I will agree today to certainly provide separately to Congress a crosswalk that can get you from each project in our research and development plan back to the budget data in a way that makes sense.

I hesitate to commit today that we would provide that information in a way that we would disclose it for general consumption. But we would certainly not have a problem in developing that information for the needs of this committee.

Mr. LEWIS. Does the plan also project the growth in the number of FAA personnel to implement and conduct the necessary research?

Mr. DEL BALZO. No, it does not. We are assuming that the projects and time frame that we have laid out is based upon 645, I think is the number, R&D positions. And we do not build into that program any additional resources.

Mr. LEWIS. You don't think they're necessary?

Mr. DEL BALZO. No, I—there's a difference between not building it into a program and thinking whether or not they're necessary.

You can always do; the more you have, the more you can do. We built the plan based upon what we have. Is that enough to do the plan as we have designed it? The answer is yes.

Is there more that we could do quicker if we had more to work with? The answer is yes.

Would I like more? You always like more.

Mr. LEWIS. Is there—is there not any sense of urgency in any of these items in the plan that you've come up with that would require additional personnel for a short period of time, or looking to contracting this out to areas in the private sector to accelerate some of this research?

Mr. DEL BALZO. Congressman, I think there are. We go back to the beginning. We—we spent our time early on in building a plan,

and we did that, and I think it's a good plan—not perfect; first edition, but it'll get better.

Our second objective was to gain credibility to convince people, one, that the agency was serious and that in fact we had a program that was responsive to requirements.

Our third objective was to establish a capability, to carry it out, and that includes a management control function, and it includes an organization, and I think we're doing those fairly well.

Establishing a capability also means having the resources to get the job done. Resources in this case means not just funding. It means people. And it means not just numbers of people; it means quality people.

And I would kid you if I told you I were not concerned about the—not just the numbers part, but the quality part.

Because, Congressman, I would tell you that if we don't find a way to attract young technologists into the organization, and hold them, we can have any plan that we like and it'll fail. Yes, I'm concerned about that.

Mr. LEWIS. The GAO also stated in their testimony that like 35.3 percent of this year's request is intended for projects with exclusive long-term benefits.

How does this compare with your assessment of the percent of research programs with long-term benefits?

Mr. DEL BALZO. We're probably not that far apart, dependent upon how one defines "long-term research." I would say that long-term research is certainly more than 20 percent—whether or not it's 35, I don't know, we could argue about that. I would say that it's probably between 20 and 35 percent.

Mr. LEWIS. Twenty and 35 is a pretty good number.

Mr. DEL BALZO. Yes, it is. Yes, it is.

Mr. LEWIS. That's 15 percent difference.

Mr. DEL BALZO. Depends upon, again, how one—how one defines "long-term research." Long-term research to me certainly says a major part of our Aging Aircraft program is long-term research. Long-term research is our Human Factors program. Long-term research is synthetic vision. Long-term research is satellite applications. Long-term research is concept work on a system for the 21st century.

Long-term research used to be TCAS. If you were to ask me is TCAS long-term research today no, it is not; it is now transitioned into nearer term.

Long-term research used to be AERA 3. I don't think AERA 3 is long-term anymore; it's near-term.

So depending upon where one draws the line, I think we could argue about that 15 percent difference.

Mr. LEWIS. How about continuous research? Do you continue that—do you consider that part of long-term research; research on a continuous basis?

Mr. DEL BALZO. Yes, I do. Our challenge is to institutionalize a long-term research based upon always looking at the potential of new technology to solve and address long-term problems that have always plagued us.

I think the answer is certainly yes. There are areas where you'll always be doing continuous research. I'm sure that the area that is

certainly close to your heart has to do with post-crash fires. You can never be satisfied.

And I've heard you say that what's the ideal? The ideal should be an aircraft that never burns.

Can you achieve that? Probably not.

Do you want to keep that as a goal? Sure you do. Because just the striving for perfection is worth the effort.

Mr. LEWIS. You're—you're the first guy in FAA that's said that to me—after two years. Thank you.

Mr. DEL BALZO. Okay.

Mr. LEWIS. I'd like to also ask you about the reprogramming actions of FAA that we discussed the 70 out of almost a hundred subprograms and things like this.

How do you feel about this reprogramming of people? Do you feel this affects your priorities and affects your general overall research?

And I—I recognize that there are times that you had to have crash programs and establish a task force and get the job done. But usually what happens, those people don't go back to their jobs.

How do you feel about that?

Mr. DEL BALZO. I think there's always a need for reprogramming. You always need to be able to respond quickly and reprogram real time. If you were to look at reprogramming actions that we did in both '88 and '89, I'm proud of that. I'm proud of that because, remember where we came from in '88 and '89. Our challenge in '88 and '89 was to reshape a program; reshape a program around old budgets.

If you're going to have an aggressive program and you're going to reshape a program around an old budget, you've got to be able to do a significant amount of reprogramming. So that's what we did.

I would tell you that the—I would hope that the numbers that GAO used today—they're right, I don't challenge those—will be an anomaly. It will be a one-time significant amount of reprogramming that has been done.

I am sure as the—the more we fine-tune an R&D program and the more we institutionalize it, the less traumatic those reprogramming actions will become.

Mr. LEWIS. What happens to the scientists when they are reprogrammed? Do they wind up back on the same project after a period of time? Or do they never go back to that project and someone has to just interpret their data, and someone new comes along, or what—how do you handle this internal view?

Mr. DEL BALZO. Let me tell you that we handle it on a case-by-case basis. Sometimes people move out and move back. Sometimes people move out into new programs and don't come back. You do that for several reasons. One, sometimes you do it for career development. Two, you do it because the program that you have reprogrammed people into, is one, more important in terms of priorities and, two, it's longlasting. So it's not a short-term requirement.

We do that. I think we could do it better. And we will try to do it better. But I think you do it case-by-case.

Mr. LEWIS. Do you have a criteria that you have established for transferring your funds within FAA to various research projects? Do you have a policy or an established procedure for that?

Mr. DEL BALZO. No, we don't. We would kid you if we did. Or we certainly don't have it written down. We might look at how resources are allocated in our FY '90 program.

What you find is that 90 percent of our resources are probably allocated to—gee, I haven't counted up, but I would say less than 15—15 major programs. The other 10 percent is allocated to lower priority programs.

One of the things that happens to you is when you're dealing with a research budget—in our case, of $165 million—you almost wind up with everything that that $165 million—that is, that—that the $165 million is being spent on—being high priority. I mean, the system almost forces you to concentrate on those programs that are the highest priority.

And so do we do that consciously? No, we don't. We need to do a better job of establishing priorities and we need to do it in the open so that we understand what we're doing. We don't do that very well today.

But, on the other hand, I would tell you that what we have done is not bad.

Mr. LEWIS. I would like to also ask you in relation to that, how can any research program be long-term if the funding is constantly changing by reprogramming?

Mr. DEL BALZO. Very difficult. Again, it's difficult for two reasons. I think you and I have shared this conversation before.

One has to do with the culture. One has to do with institutionalizing an R&D culture and an organization that is committed to and recognizes the value of long-term research. That has not been the case in the past. Through the efforts of this committee and—and the Act that was passed, I think that has forced this thing to that mindset. And what I see happening in our own organization is the culture slowly starting to change.

So that's step one.

Given that you've established the culture, you then must continue to guard against, in an operational organization that we are, when today's crisis occurs, the first tendency will be, if I can't get anymore, where am I going to get it from? And what we tend to take it from is the long-term research program.

Mr. LEWIS. That takes me to my next question.

Does FAA reprogram research funds to non-research areas? And if so, what—what type of percentage would be reprogrammed?

Mr. DEL BALZO. I can't give you an exact percentage this moment. And it's not because we don't know what it is. I just don't happen to have those numbers with me.

The answer is yes, we do program R&D money into, I would say, a capital investment program where one could argue about whether or not it's true R&D, or whether or not it should be F&E funded.

I would tell you that we try as best we can whenever we do that to ensure that the money is programmed into an F&E program that requires additional engineering. So maybe it's not research, maybe it's not development, but it certainly falls in the engineering category.

Probably the best example I can give that comes to mind at the moment is the Advanced Automation System. Here is a—almost $4 billion capital investment program, comes out of F&E. But the people assigned to that program are funded out of the R&D appropriation.

Is that precisely correct? I think we could argue about that. I would—I would argue that it could be, because there is still a lot of engineering work that needs to be done, in refining that final design.

Mr. LEWIS. I would—in my discussions with the GAO, I did ask them about historical information and data being passed, and number of staff on projects, and project milestones, and contractors, things of that nature.

They made a statement in there, page 10 of their testimony, that FAA does not have this information readily available.

Do you have it? Does it exist?

Mr. DEL BALZO. This is one time that I wish I could say, as usual, GAO is wrong, don't agree, they missed the point.

GAO is not wrong. They did not miss the point.

I think there's a reason which I also think is understandable. 1960s, 1970s, we had a good R&D organization. Good plans, good priorities, good resource allocation. We knew where the resources were—were going.

As a result of that work, as a result of that program, we led into a NAS Plan—the $15 billion capital investment—so the research paid off.

1980 to 1988, we saw R&D being de-emphasized; the destruction of an R&D organization, pretty much. And major emphasis being on NAS Plan—Plan implementation. At the time, that was the right decision.

1988 saw the Research Act. R&D's now back. It's healthier, I think, than its ever been. But we've got a lot of rebuilding to do. We've got to build the systems. We've got to build the data management systems. We've got to do the things the GAA—GAO—says don't exist today. They do not; and we need to do that.

Mr. LEWIS. I guess I'll forget my next question on that, you pretty much answered it.

The Science Committee has had difficulty receiving the FAA budget estimates for the research program. In order to establish a clear policy, the Chairman of the full Science Committee—Chairman Roe—wrote to Secretary Skinner requesting attention to this matter. And apparently the committee has not yet received a written reply.

What is the FAA's official policy on giving FAA research budget information to the Science Committee?

Mr. DEL BALZO. Congressman, I know that is an issue. I am not conversant today with the real issue and what it is that stands in the way of us being able to provide you with the information that you're asking for. I know that we did not do it very well this year.

We will work out a way to provide you with the information you need for the next fiscal year.

Mr. LEWIS. Well, I would hope so. This subcommittee is the authorizing subcommittee for your research budget. And I think the—the Act that was passed certainly exemplifies the need for

this information. And we have this a lot of times with authorization committees; not receiving this information. On the front of your budget—I guess right here it states, you know, Federal Aviation budget estimates submitted for use of the committees on appropriations.

Well, unless we authorize it, then it can't be spent. But I don't know——

Mr. DEL BALZO. Yes, sir.

Mr. LEWIS [continuing]. You can find ways to do that sometimes.

Nonetheless, I guess maybe we feel like we're being snubbed, or maybe we feel that, you know, that we can't do our job as—as intended.

And I appreciate the fact that you will be working toward seeing that this is done.

I'd like to just read something here that's in your program.

And the statement was made that Congress has sent as strong a message that it could ever send to an agency to do a job. And I'd like to read it: "The RE&D program must focus on specific redo problems that can be solved with a vision for the future. This requires commitment and support not only from the FAA but from the OST, OMB, Congress, the users, and industry. The new Aviation Safety Research Act is indicative of that necessary support from Congress. We need a vision of the future and a road map to get there."

They are your words.

Mr. DEL BALZO. I agree with all of that.

Mr. LEWIS. I think that the Congress has made the commitment to do this. I guess this year, being all fired up and the author of the Act, I was very much concerned that you guys were short-changing yourself on your budget. I thought you had a great, excellent opportunity to come forward with a budget with a request for more funds to provide a greater need for your scientists, engineers, and your technical areas, as well as those administrative areas, to move ahead in a rapid motion.

And I must admit, I haven't had the opportunity to completely read through your preliminary plan that I did have a copy of and, hopefully, by next weekend have completed that chore.

But I believe that this subcommittee, and I as an individual Member of the subcommittee, are ready to move forward and do what is necessary to assist in getting these things done because I think that we all agree that they have to be done.

And I think that we have a tremendous responsibility, not only Congress but you as well, in order to move forward. And I must say, Mr. Del Balzo, that I was very impressed with the candor of your answers. And it's not too often that we have someone from the agencies before our subcommittee, or many other ones that I serve on, that come forth with all the candor that you have. They usually like to sit back and stonewall and we get the information other ways. But I appreciate your cooperation. Thank you very much.

Mr. DEL BALZO. Mr. Lewis, that's something you can always count on.

Mr. VALENTINE. Mr. Del Balzo, we appreciate your testimony and we appreciate your patience.

Mr. LEWIS. Mr. Chairman.

Mr. VALENTINE. Yes?

Mr. LEWIS. Mr. Buechner, a Member of the committee, has a question for FAA, and I ask unanimous consent that it be submitted for the record.

Mr. VALENTINE. Without objection.

[The question follows:]

It is my understanding that the FAA's choice for the Dependent Converging Approach Software is the St. Louis Airport. In fact, during your demonstration today, your models are based on the St. Louis Airport. Could you tell me when you plan to install this software at Lambert International Airport in St. Louis?

[The information follows:]

The St. Louis Airport has been chosen as the site for initial field evaluation of the Converging Runways Approach Aid. Field evaluation will begin after a software modification to the St. Louis ARTS III system is installed in October 1989.

Mr. VALENTINE. There being no further business to come before this subcommittee, we will stand adjourned.

Mr. DEL BALZO. Thank you.

[Whereupon, at 5:20 p.m., the subcommittee was adjourned.]

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